

THE AUSTRALIAN SPECIES OF *ECNOMUS* McLACHLAN
(TRICHOPTERA: ECNOMIDAE)

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Abstract

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The Australian species of the caddisfly genus *Ecnomus* McLachlan are revised. Descriptions, distribution maps and keys are provided for males of 40 species, all of which are endemic; 34 are newly described. Females of 12 southern Australian species are described.

Introduction

The family Ecnomidae was proposed by Lepneva (1956) and independently by Marlier (1958). Kimmins (1957) also established characters for separating ecnomids from psychomyiids. Neboiss (1977) adequately summarized establishment of the family Ecnomidae and provided a family diagnosis.

The genus *Ecnomus* McLachlan is distributed primarily in the Ethiopian (about 50 species, Barnard and Clark, 1986) and Oriental regions (about 40 species, Fischer, 1960-1973) and Australia (40 species, this study) and is unknown from the Nearctic and Neotropical regions.

Ecnomus species are diverse and widespread throughout Australia, although only six species have been described previously. The identity of the first of these, *E. continentalis* Ulmer from north Queensland (Ulmer, 1916) has been the subject of considerable confusion. Specimens purported to be *E. continentalis* have been figured from South Australia (Mosely and Kimmins, 1953), Tasmania (Neboiss, 1977) and south-east Queensland (Neboiss, 1978). Neboiss (1982) figured and redefined *E. continentalis*, and described two new species, *E. pansus* Neboiss to accommodate the South Australian specimen, and *E. cygnitus* Neboiss for the SE-Queensland specimen. Other species previously described are *E. tillyardi* Mosely (Mosely and Kimmins, 1953) and *E. russellius* Neboiss, 1977 both from Tasmania and *E. turgidus* Neboiss, 1982 from south-west Australia.

Species recognition is based on differences in male and female genitalia, although positive identification usually requires clearing of genitalia. The usual problem of association of males

and females is compounded by the presence of up to ten species at one site in each of the Kimberley and Kakadu regions and commonly 3-7 species at other northern Australian sites. In southern Australia often two or three or up to five species have been collected at some sites. Males and females of twelve southern Australian species have been associated, mainly through breeding out of larvae.

Materials and Methods

Most of the material examined during the present study is held in the collections of the Museum of Victoria, Melbourne (NMV). Loan material from the Queensland Museum, Brisbane (QM), the Northern Territory Museum of Arts and Sciences, Darwin (NTM), the Australian National Insect Collection, Canberra (ANIC) and the Australian Museum, Sydney (AM), was also examined. All specimens, including types, mentioned in the text are lodged in the NMV unless stated otherwise. Repositories for type material of previously described species include the Naturhistoriska Riksmuseet, Stockholm (NRS), the British Museum of Natural History, London (BMNH) and the Western Australian Museum, Perth (WAM).

Descriptions of the six established species are based on new material after comparison with the original descriptions. In most cases the figured specimen has also been compared with the type specimen.

Names of prolific collectors have been abbreviated in the text as follows: J.E. Bishop - J.E.B.; J. Blyth - J.B.; A. Neboiss - A.N.; P. Suter - P.S.; A. Wells - A.W.

All figured specimens are identified by the author's notebook number, with the prefix CT-; occasional PT-numbers refer to the notebook used by Dr A. Neboiss (NMV). Genitalia were drawn from specimens macerated in KOH, cleared and transferred to glycerol for drawing. The figures of wing venation were prepared with the aid of a camera lucida, from detached wings, denuded of hair and mounted in glycerol as temporary mounts (Neboiss, 1977).

Terminology used follows that of Nielsen (1957, 1978, 1981) and Barnard and Clark (1986). Abbreviations for genitalic parts are as shown in Figs 1, 2, 83, 84.

Characteristics of the Australian Fauna

Typically in the Australian fauna the "southern" species are larger (anterior wing length (AWL) male, usually greater than 5 mm), have darker wings (usually brown to dark greyish-brown with paler irrorations), superior appendages of males tend to be long. The "northern" species are commonly smaller (AWL male usually less than 5 mm), wings paler (typically fawn to brown with paler irrorations), superior appendages of males mostly broad-based and often short. "Southern" species with ranges extending into north Queensland and the Northern Territory, are noticeably smaller and paler in the northern parts of their range. Size and wing colour can be useful characters, but are variable. Wing colour should also be considered with caution since the colour fades in alcohol. Wing venation is conservative and is therefore not useful for species separation. The chief discriminators are found in male and female genitalia.

Superior appendages of males are characterized by a field of mesally-directed spiny setae, usually restricted to the apices. Inferior appendages differ between species, and are a good taxonomic character for species separation. Paired parameres are found in all species except one (where they have apparently fused together). The phallus is usually obliquely narrowed subapically, and in many species a pair of spines is embedded in the ventral surface subapically. A pair of mesoventral processes is located on segment ten. Three species have a pair of processes on the posterolateral margin of segment nine. The shape of the ventral plates vary slightly in females. Many species also have small "pockets", which differ in their shape and position on the ventral plate. These "pockets" seem to match the shape and position of the mesal pro-

jection on the inferior appendage of the corresponding male, which during copulation forms a "key in lock" mechanism (Figs 107, 108).

On the basis of male genitalia, many Australian species can be placed into species groups, however many other species, although distinctive, are intermediate between several groups. Therefore in this study the species are not grouped formally.

Ecnomus McLachlan

Ecnomus McLachlan, 1864: 30. — Ulmer, 1907: 190. — Mosely and Kimmins, 1953: 378. — Neboiss, 1977: 54.

Type species. Philopotamus tenellus Rambur, 1842 (original designation).

Diagnosis (revised after Neboiss, 1977). Maxillary palpi with segment 1 short, segments 2, 3 and 4 successively slightly longer than preceding segment, segment 5 about as long as all other segments together. Mesoscutum and scutellum each with a pair of rounded warts. Anterior wings with R1 forked at apex; apical forks 1, 2, 3, 4 and 5 present, fork 1 short; discoidal, median and thyridial cells present. Posterior wings slightly narrower than anterior wings; forks 2 and 5 present; discoidal cell absent. Tibial spurs 3:4:4.

Remarks. The other ecnomid genus in Australia, *Ecnomina* Kimmins is distinguished from *Ecnomus* by the absence of fork 1 in the anterior wing, presence of fork 3 and the discoidal cell in the posterior wing, and abdominal segments 9 and 10 elongate in the female.

Checklist of Australian species of *Ecnomus*

- Ecnomus ancisus* sp. nov.
- E. apiculatus* sp. nov.
- E. bishopi* sp. nov.
- E. blythi* sp. nov.
- E. centralis* sp. nov.
- E. clavatus* sp. nov.
- E. continentalis* Ulmer, 1916
- E. cuspidis* sp. nov.
- E. cygnitus* Neboiss, 1982
- E. deani* sp. nov.
- E. digrutus* sp. nov.
- E. ingibandi* sp. nov.
- E. jimba* sp. nov.
- E. kakaduensis* sp. nov.
- E. karakoi* sp. nov.
- E. karawalla* sp. nov.

<i>E. kerema</i> sp. nov.	<i>E. tillyardi</i> Mosely, 1953
<i>E. kinka</i> sp. nov.	<i>E. tropicus</i> sp. nov.
<i>E. kitabal</i> sp. nov.	<i>E. tridigitus</i> sp. nov.
<i>E. larakia</i> sp. nov.	<i>E. turrbal</i> sp. nov.
<i>E. miriwud</i> sp. nov.	<i>E. turgidus</i> Neboiss, 1982
<i>E. myallensis</i> sp. nov.	<i>E. veratus</i> sp. nov.
<i>E. neboissi</i> sp. nov.	<i>E. volsellus</i> sp. nov.
<i>E. nibbor</i> sp. nov.	<i>E. walajandari</i> sp. nov.
<i>E. pakadji</i> sp. nov.	<i>E. wagengugurra</i> sp. nov.
<i>E. pansus</i> Neboiss, 1982	<i>E. wellsae</i> sp. nov.
<i>E. pilbarensis</i> sp. nov.	<i>E. woronan</i> sp. nov.
<i>E. russellius</i> Neboiss, 1977	<i>E. yabbura</i> sp. nov.

Key to Males of Australian *Ecnomus* McLachlan

Critical distinguishing characters used in the key are denoted by an arrow on the figures.

1. Process present on postero-lateral margin of segment nine (Figs 1, 3, 5) 2
- Without process on segment nine (Figs 7, 10) 4
- 2(1). Superior appendage with ventrally directed projection on basiventral margin (Fig. 1) N-WA *E. ingibandi* sp. nov.
- Superior appendage without ventrally directed projection (Figs 3, 5) 3
- 3(2). Superior appendage in lateral view, broadbased, length less than 1.5× width (Fig. 3) NE-NSW, E-Qld, N-WA *E. kitabal* sp. nov.
- Superior appendage in lateral view, elongated, length greater than 2× width (Fig. 5) N-WA, N-NT *E. jimba* sp. nov.
- 4(1). Parameres fused to form a single elongated, downcurved process (Figs 7, 8) N-WA, N-NT, NE-Qld *E. veratus* sp. nov.
- Parameres not fused (Figs 11, 13) 5
- 5(4). Superior appendage in lateral view, broadbased, strongly narrowed in distal third, with ventrally directed projection on basiventral margin (Figs 10, 12) 6
- Without above combination of characters (Figs 14, 45, 51, 67) 7
- 6(5). Inferior appendage in ventral view with smoothly curved mesal margin, broadest in basal half (Fig. 11), in lateral view with slender, digitiform apical projection (Fig. 10) S-WA, SA, Vic., NSW, Qld, S-NT *E. turgidus* Neboiss
- Inferior appendage in ventral view with shallowly incised mesal margin, broadest in apical half (Fig. 13), in lateral view, with robust, digitiform subapical projection (Fig. 12) N-WA, N-NT *E. digrutus* sp. nov.
- 7(5). Inferior appendage in ventral view with 2 distinct mesal projections (Figs 15, 17, 19, 21, 23) 8
- Inferior appendage in ventral view with only 1 or no distinct mesal projection (Figs 25, 50) 12
- 8(7). Inferior appendage in ventral view, with apex rounded to bluntly angled (Figs 15, 17) 9
- Inferior appendage in ventral view, with apex acute (Figs 19, 21, 23) 10
- 9(8). Inferior appendage in ventral view, short, robust, length about 2× width (Figs 15, 15a) N-WA, N-NT, NE-Qld *E. woronan* sp. nov.
- Inferior appendage in ventral view, length about 3× width (Fig. 17) N-NT, N-WA *E. kakaduensis* sp. nov.

- 10(8). Inferior appendage triangular in lateral view (Fig. 18), in ventral view, mesal projections short (Fig. 19) NE-NSW, E-Qld. *E. wellsae* sp. nov.
- Inferior appendage bilid apically in lateral view (Figs 20, 22), in ventral view mesal projections long (Figs 21, 23) 11
- 11(10). Inferior appendage in ventral view slender, length about 3× width (Fig. 21); superior appendage constricted distally, apex downturned; paramere without bulbous tip (Fig. 20) NE-NSW, SE-Qld
E. tridigitus sp. nov.
- Inferior appendage in ventral view short, robust, length about 2× width (Fig. 23); superior appendage rod-like in lateral view, slightly tapered distally; paramere with bulbous tip (Fig. 22) E-Vic., SE-Qld
E. neboissi sp. nov.
- 12(7). Inferior appendage in lateral view, broadest in middle (Figs 24, 26, 28), middle width in lateral view greater than twice middle width in ventral view (Figs 24, 25, 26, 27, 28, 29); paramere robust, apex curved downwards at right angles to form a distinct hook (Figs 24, 26, 28) 13
- Not above combination (Figs 51, 52, 65, 66, 71, 72) 15
- 13(12). Inferior appendage bifid apically in ventral view (Fig. 25) E-Qld, N-NT
E. turrbal sp. nov.
- Inferior appendage in ventral view, with slender apical projection only (Figs 27, 29), or rounded apex and sub-apical digitiform projection (Fig. 27a) 14
- 14(13). Inferior appendage in lateral view, sub-trapezoidal in shape, proximal angle of upper margin obtuse (Figs 26, 26a), distal angle produced into a dorso-mesally directed digitiform projection (Figs. 26, 26a, 27, 27a) N-WA, N-NT, E-Qld
E. cuspidis sp. nov.
- Inferior appendage in lateral view, trigonal in shape, proximal angle of upper margin forms a right angle, (Fig. 28), in ventral view, distal angle produced into a mesally directed digitiform projection (Fig. 29) N-WA
E. bishopi sp. nov.
- 15(12). Inferior appendage in ventral view, with 1 distinct mesal projection (Figs 31, 33, 40) 16
- Inferior appendage in ventral view, without a distinct mesal projection (Figs 52, 54) (inferior appendage may have shallow mesal concavity in distal half, but lacks distinct mesal projection (Figs 62, 68)) 24
- 16(15). Genitalia in lateral view, with inferior appendage longer than superior appendage (Fig. 30); inferior appendage with mesal projection in basal third (Fig. 31) N-WA, N-NT, E-Qld
E. clavatus sp. nov.
- Genitalia in lateral view, with inferior appendage equal to, or shorter than, superior appendage (Figs 34a, 36); inferior appendage usually with mesal projection in distal 2/3 (Figs 35a, 37) 17
- 17(16). Inferior appendage in ventral view broadbased, with robust mesal projection, apex tapered strongly (Figs 33, 35a, 37) 18
- Inferior appendage in ventral view, not as above (Figs 40, 44) 20
- 18(17). Inferior appendage in ventral view, with apex of mesal projection in distal half (Fig. 33) E-Vic., E-NSW
E. deani sp. nov.
- Inferior appendage in ventral view, with apex of mesal projection in basal half (Figs 35a, 37) 19
- 19(18). Inferior appendage in ventral view, straight distally (Figs 35a, b) Tas., SE-SA, Vic., NE-NSW
E. tillyardi Mosely
- Inferior appendage in ventral view, mesally directed distally (Fig. 37) E-Vic., E-NSW, SE-Qld
E. volsellus sp. nov.
- 20(17). Inferior appendage in ventral view slender, length about 3× width, mesal projection separated widely from the apical angle forming a deep, rounded concavity (Figs 40, 42); paramere distally slender, depressed (Figs 39, 41) 21

- Inferior appendage in ventral view short, robust, length about 2× width, mesal projection narrowly separated from the apical angle forming a shallow or V-shaped concavity (Figs 44, 46, 48); paramere curved downwards distally to form a distinct hook (Figs 43, 45, 47) 22
- 21(20). Superior appendage in lateral view elongated, length about 5× width, apex slightly dilated (Fig. 39) S-WA, SA, Vic., NSW, Qld, NT
 *E. pansus* Neboiss
- Superior appendage in lateral view long, robust, length about 3× width, broadest in median section, tapered slightly distally (Fig. 41) SE-SA, Tas., Vic., E-NSW, E-Qld *E. cygnitus* Neboiss
- 22(20). Paramere distally curved downwards at right angles to form a distinctive, elongated hook (Fig. 43) NE-Qld *E. kerema* sp. nov.
- Paramere distally curved downwards at right angles to form a short hook (Figs 45, 47) 23
- 23(22). Inferior appendage in ventral view, with long digitiform subapical mesal projection, narrowly separated from the apical angle, forming a deep notch (Figs 46, 46a) SE-SA, Vic., E-NSW, E-Qld, S-NT
 *E. continentalis* Ulmer
- Inferior appendage in ventral view, with short subapical mesal projection, separated from the apical angle, forming a shallow cavity (Fig. 48) E-Vic., E-NSW *E. nibbor* sp. nov.
- 24(15). Superior appendage in lateral view, broadbased with strong constriction at about middle, minimum width in distal third less than 1/4 maximum width in basal half (Figs 49, 51) 25
- Superior appendage in lateral view, if broadbased then gradually tapered distally, width at distal third at least 1/3 maximum width in basal half (Figs 53, 59, 77) 26
- 25(24). Superior appendage in lateral view, with dilated apex (Fig. 49) N-WA, N-NT *E. ancisus* sp. nov.
- Superior appendage in lateral view, without dilated apex (Fig. 51) N-WA, N-NT *E. blythi* sp. nov.
- 26(24). Inferior appendage in lateral view, with dorsal digitiform projection (Figs 53, 55) 27
- Inferior appendage in lateral view, without dorsal projection (Figs 57, 59) 28
- 27(26). Inferior appendage in lateral view, tapered distally, with dorsal projection at about distal third (Fig. 53) N-SA, NT, SW-Qld, NW-NSW
 *E. centralis* sp. nov.
- Inferior appendage in lateral view, not tapered distally, with dorsal projection at about basal third (Fig. 55) SE-Qld, Vic.
 *E. myallensis* sp. nov.
- 28(26). Inferior appendage in lateral view, long and slender, length greater than 6× width (Fig. 57) N-WA, N-NT *E. yabbura* sp. nov.
- Inferior appendage in lateral view, shorter, more robust, length less than 5× width (Figs 59, 61) 29
- 29(28). Superior appendage with mesally directed spiny setae spread at least half way along mesal margin (Fig. 60) N-WA, N-NT *E. miriwud* sp. nov.
- Superior appendage with mesally directed spiny setae clumped in distal third (Figs 62, 72) 30
- 30(29). Meso-ventral process of segment 10, with apex produced into 3 small knobs each with an attached hair, resulting in a 3-pronged shape (Fig. 61) NE-NSW, NE-Qld *E. wagenugurra* sp. nov.
- Meso-ventral process of segment 10, with apex simple, but usually with 2 or 3 attached hairs (Figs 67, 81) 31
- 31(30). Inferior appendage dorso-ventrally flattened, width in middle in ventral

- view, broader than width in middle in lateral view (Figs 63, 64, 65, 66, 67, 68); large insect, AWL greater than 5 mm 32
- Inferior appendage not dorso-ventrally flattened, width in middle in ventral view, narrower or equal to width in middle in lateral view (Figs 69, 70, 81, 82); small insect, AWL less than 5 mm 34
- 32(31). Superior appendage in lateral view, with downwardly produced basiventral angle extended into a short projection; paramere in lateral view curved downward at right angles to form a distinct hook (Figs 65, 67) 33
- Superior appendage in lateral view, with downwardly produced basiventral angle not extended into a projection; paramere in lateral view slightly bulbous, apex not curved downwards (Fig. 63) SW-Vic *E. karawalla* sp. nov.
- 33(32). Phallus in lateral view, tapered distally, with a distinctive, laterally-compressed apical process (Fig. 65); inferior appendage in ventral view, length nearly 3× width (Fig. 66) Tas., Vic., E-NSW, SE-Qld *E. russellius* Neboiss
- Phallus in lateral view, obliquely narrowed distally with a short apical process (Fig. 67); inferior appendage in ventral view short, robust, length about 2× width (Fig. 68) SW-Vic *E. karakoi* sp. nov.
- 34(31). Inferior appendage especially in ventro-lateral view, with bifid apex (Figs 69, 70) NE-Qld, N-NT, N-WA *E. tropicus* sp. nov.
- Inferior appendage with apex not bifid (Figs 72, 74) 35
- 35(34). Inferior appendage in lateral view with slender digitiform process apically (Figs 71, 71a) N-WA, SE-Qld *E. apiculatus* sp. nov.
- Inferior appendage in lateral view either rounded or with a short, broad-based process apically (Figs 77, 79) 36
- 36(35). Inferior appendage in ventral view, with inner margin subapically inflected towards middle of apical projection (Figs 74, 76) 37
- Inferior appendage in ventral view, with inner margin subapically inflected towards mesal margin of apical projection (Figs. 78, 82) . 38
- 37(36). Inferior appendage in ventral view rod-shaped, length about 4× width (Fig. 74) N-WA, N-NT, NE-Qld *E. kinka* sp. nov.
- Inferior appendage in ventral view length about 2.5× width, not parallel-sided, inner margin curved (Fig. 76) N-WA, N-NT, NE-Qld *E. pilbarensis* sp. nov.
- 38(36). Superior appendage in lateral view short, broadbased, length less than 2× width (Fig. 77) N-WA, N-NT, NE-Qld *E. larakia* sp. nov.
- Superior appendage in lateral view long, length greater than 3× width (Figs 79, 81) 39
- 39(38). Inferior appendage in ventral view slender, tapered gradually distally, inflected (Fig. 80); paramere in lateral view robust (Fig. 79) NE-Qld. *E. pakadji* sp. nov.
- Inferior appendage in ventral view robust, broadbased, narrowed markedly in distal third (Fig. 82); paramere in lateral view, slender (Fig. 81) N-WA, N-NT *E. walajandari* sp. nov.

***Ecnomus ingibandi* sp. nov.**

Figures 1, 2

Type material. Holotype male, Western Australia, Millstream, Fortescue River S of Roebourne, 12 Nov 1978, M.S. and B.J. Moulds (NMV, T-10001).

Paratypes. 1 male (specimen CT-053 figured), collected with holotype; 1 male, Western Australia,

Crossing Pool, Millstream, Pilbara, 21 Oct 1979, J. Blyth (NMV).

Description. Male. Wings uniformly pale fawn. Pair of processes on distal margin of abdominal segment nine ventrally directed, slightly tapered apically (Fig. 1). Genitalia with superior appendage short, in lateral view broadbased, about as

long as wide, downwardly pointed basiventral angle produced into a small digitiform projection on ventral margin near base. Inferior appendage longer than superior appendage (Fig. 1), in ventral view length about 3× width, slightly tapered distally (Fig. 2). In lateral view, paramere gradually depressed distally; phallus without ventral swelling, upper apical angle extended to a short point (Fig. 1).

Female. Unknown.

Length of anterior wing: male 3.6–3.9 mm.

Etymology. Named after the Ingibandi aboriginal tribe who inhabited the region including the type locality.

Distribution. WA (Pilbara region – type locality only) (Fig. 110).

Remarks. Only three males are known, all collected from one locality. The species is similar to *E. kitabal* sp. nov., and *E. jimba* sp. nov., in that males of all three species have a pair of processes on segment nine. *E. ingibandi* has a ventral projection on both superior appendages.

Enomus kitabal sp. nov.

Figures 3, 4

Type material. Holotype male, New South Wales, Clarence River at Yates Crossing, 26 Oct 1981, Wells and Carter (NMV, T-10003).

Paratypes. 14 males (specimen CT-044 figured), collected with holotype (NMV).

Other material examined. Queensland, 3 males, Brisbane R., nr Kholo, 9 Mar 1973, M.H. Colbo; 1 male, Brisbane R., Kholo, 14 Sep 1972, M.H. Colbo; 1 male, same loc., 9 Mar 1973, M.H. Colbo; 1 male, 10 km S of Innisfail, 17°34'S, 146°01'E, 18 Nov 1988, K. Walker; 1 male, Mulgrave R., W of Gordonvale, 29 Apr 1979, A.W.; 4 males, Laura, Cape York Peninsula, 7 Oct 1979, M.S. and B.J. Moulds; 2 males, McLeod R., 15 km W of Mt Carbine, 22–23 Jun 1975, S.R. Monteith (ANIC).

Western Australia, 1 male (genitalia slightly damaged), Maggie Ck, 3 Feb 1978, J.E.B.

Description. Male. Wings pale fawn to brown with paler irrorations. Pair of processes on segment nine in ventro-lateral view, slender. Genitalia with superior appendage short, in lateral view broadbased, narrowed distally; inferior appendage as long as superior appendage (Fig. 3), in ventral view, length about 3× width, tapered slightly distally (Fig. 4); paramere gradually depressed distally; phallus (Fig. 3), essentially as for *E. ingibandi*.

Female. Unknown.

Length of anterior wing: male 3.8–5.2 mm.

Etymology. Named after the Kitabal aboriginal tribe who inhabited the region including the type locality.

Distribution. NE-NSW, E-Qld, N-WA (Kimberley region) (Fig. 110).

Remarks. Males are similar to *E. ingibandi* and *E. jimba* sp. nov., in the presence of a pair of processes on segment nine, but differ in the form of the superior appendages. The shape of the superior and inferior appendages are similar to *E. larakia* sp. nov., and *E. miriwud* sp. nov., but *E. kitabal* can be separated by the processes on segment nine. The apices of the inferior appendages are slightly more pointed in N-Western Australian and NE-Queensland specimens.

Ecnomus jimba sp. nov.

Figures 5, 6

Type material. Holotype male, Western Australia, Ord River, 9 km N Kununurra, 19 Sep 1979, J. Blyth (NMV, T-10018).

Paratypes. 20 males (specimen CT-046 figured), collected with holotype (NMV).

Other material examined. Western Australia, 25 males, Granite Ck, Kununurra–L Argyle Hwy, 2 Feb 1978, J.E.B.; 6 males, Mitchell Plateau, Camp Ck at crusher, 15 Feb 1979, J.E.B.; 2 males, same loc., 18 Feb 1979, J.E.B.; 2 males, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 3 males, Four Mile Ck, 2 Feb 1977, J.E.B.; 1 male, Stonewall Ck, 4 Feb 1978, J.E.B.

Northern Territory, 3 males, Katherine Gorge Nat. Pk, 13 Aug 1979, J.B.; 40 males, South Alligator R. nr Koolpin Crossing, 14 Oct 1987, P. Dostine; 13 males, SAR, site 1, 14 Jun 1987, P. Dostine; 5 males, same loc., 30 Sep 1988, P. Dostine; 13 males, same loc., October 1988, P. Dostine; 3 males, ARRS South Alligator R. at Gimbat OSS Station, 28 Apr 1988, P. Dostine; 2 males, same loc., 24 May 1988, A.W., P.S.; 1 male, ARRS South Alligator R. below Fisher Ck jn, 24 May 1988, A.W., P.S.; 4 males, ARRS South Alligator R. above Fisher Ck jn, 24 May 1988, A.W., P.S.; 9 males, same loc., 19–20 Apr 1989, A.W., P.S.; 3 males, ARRS South Alligator R. below BHP camp, 25 May 1988, A.W., P.S.; 30 males, ARRS Kambolgie Ck, 25–26 May 1988, A.W., P.S.; 14 males, same loc., 25 May 1988, P.S., A.W.; 1 male, Jim Jim Ck on Kakadu Hwy, 28 May 1988, P.S., A.W.; 1 male, ARRS Graveside Ck, 18 Jul 1988, P. Dostine; 1 male, SAR, Rock Hole Ck, November 1988, P. Dostine; 5 males, ARRS Ck 5 km W of OSS Gimbat Field Station, 19 Apr 1989, A.W., P.S.; 7 males, McArthur R., 48 km SSW of Borrooloola, 16°27'S, 136°05'E, 29 Oct 1975, J.C. Cardale (ANIC).

Description. Male. Wings pale fawn. In ventro-lateral view, processes on segment nine broad-based, tapered distally. Genitalia with superior

appendage long, in lateral view length nearly 3× width, broadest in basal half, tapered gradually distally (Fig. 5); in ventral view, inferior appendage length about 3× width, with small digitiform apical process (Fig. 6). In lateral view, paramere almost straight with slightly dilated apex. Phallus (Fig. 5), similar to *E. ingibandi*.

Female. Unknown.

Length of anterior wing: male 2.8–3.4 mm.

Etymology. *Jimba* – Western Australian aboriginal word for little (wing size).

Distribution. N-WA (Kimberley region), N-NT (Fig. 110).

Remarks. A small, common northern Australian species. The male also has a distal pair of processes on abdominal segment nine, but differs from *E. ingibandi* and *E. kitabal* mainly in the elongate superior appendages. The form of the superior and inferior appendages, and parameres is similar to *E. apiculatus* sp. nov., but the species can be separated by the processes on segment nine.

Ecnomus veratus sp. nov.

Figures 7, 8, 9

Type material. Holotype male, Northern Territory, Groote Eylandt, Amagule Pool, 6 Feb 1984, M. Davies (NMV, T-10039).

Paratypes. 3 males (specimen CT-056 figured), collected with holotype (NMV).

Other material examined. Western Australia. 2 males, Morgan R., Theda H.S., Kimberleys, 28 Sep 1979, J.B.; 1 male, Camp Ck at crusher, Mitchell Plateau, 15 Feb 1979, J.E.B.; 1 male, Mitchell Plateau, 30 Jan 1978, J.E.B.; 1 male, stream opposite Deadhorse Gap, I. Argyle, 19 Feb 1977, J.E.B.

Northern Territory. 1 male, South Alligator R., UDP Falls, 7 Sep 1979, J.B.; 3 males, ARRS South Alligator R., below BHP camp, 25 May 1988, P.S., A.W.; 3 males, ARRS South Alligator R., at Gimbat OSS Station, 24 May 1988, A.W., P.S.; 2 males, ARRS South Alligator R., above Fisher Ck jn, 24 May 1988, A.W., P.S.; 1 male, Jim Jim Waterhole, Kakadu Nat. Pk, 5 Sep 1979, J.B.; 3 males, Kambolgie Ck, 25 May 1988, P.S., A.W.; 5 males, Gulungul Ck, inlet to Gulungul Billabong, 20 Apr 1989, A.W., P.S.; 9 males, ARRS Radon Springs, 18–19 May 1988, A.W., P.S.; 5 males, same loc., 13–14 Apr 1989, A.W., P.S.; 1 male, Nourlangie Ck, 6 km E of Mt Cahill, 12°52'S, 132°46'E, 18 Nov 1972, J.C. Cardale (ANIC); 1 male, Nourlangie Ck, 8 km E of Mt Cahill, 12°52'S, 132°47'E, 14–15 Jun 1973, J.C. Cardale (ANIC); 1 male, Stag Ck at BHP camp, 25 May 1988, P.S., A.W.; 3 males, ARRS Magela Ck at Ranger Pipe outlet, 20 May 1988, A.W., P.S.; 1 male, same loc., 25 May 1988, A.W., P.S.; 2 males, Magela Ck, N of Georgetown Bil-

labong, 24 Mar 1983, A.J. Sharley (NTM); 1 male, same loc., 28 Mar 1983, A.J. Sharley (NTM); 1 male, Georgetown Billabong nr Jabiru, 27 Jun 1983, A.J. Sharley (NTM); 1 male, same loc., 1 Jul 1983, A.J. Sharley (NTM); 1 male, Goanna Lagoon, 1 km W of Jabiru, off Arnhem Hwy, 27 Feb 1979, R. Marchant; 1 male, same loc., 27 Mar 1980, R. Marchant; 1 male, ARRS Ck 5 km W of OSS Gimbat Field Station, 19 Apr 1989, A.W., P.S.; 1 male, ARRS Bowerbird Billabong outlet, 1 Oct 1988, P. Dostine; 1 male, Graveside Ck, 18 Jul 1988, P. Dostine; 2 males, Muirella Park, 12 Oct 1972, E.R. Riek (ANIC); 2 males, Caranbirini Waterhole, 13 km SW of Borrooloola, 16°16'S, 136°05'E, 3 Nov 1975, J.C. Cardale (ANIC).

Queensland. 1 male, Marina Plains via Musgrave, 10 May 1983, Storey and Brown; 1 male, Hann R. crossing, 76 km N Laura, 8 Sep 1974, M.S. Moulds.

Description. Male. Wings pale fawn to brown, wing venation (Fig. 9), characteristic of all other Australian species in the genus. In forewing, footstalk of fork R1 slightly shorter than in *E. volsellus* sp. nov. Genitalia with superior appendage in lateral view, broadest in basal half, tapered distally (Fig. 7). Inferior appendage in ventral view, length about 3× width, inner margin convex, tapered distally, apex constricted laterally (Fig. 8) and dilated dorso-ventrally, producing a spatulate appearance. In lateral view, single paramere with enlarged base, in distal half greatly elongated and strongly downturned; phallus dilated subapically forming a bulbous head, small apical point ventrally directed (Fig. 7).

Female. Unknown.

Length of anterior wing: male 3.7–4.2 mm.

Etymology. *Veratus* (Latin) armed with a javelin (paramere).

Distribution. N-WA (Kimberley region), N-NT, NE-Qld (Fig. 111).

Remarks. A unique Australian species due to the male possessing a single, greatly elongated paramere and a distinctive phallus. *E. veratus* is a widespread species across northern Australia.

Ecnomus turgidus Neboiss

Figures 10, 11, 97, 98

Ecnomus turgidus Neboiss, 1982: 289, fig. 20. — Neboiss, 1986: 151.

Type material. Holotype male, Western Australia, Serpentine River below Serpentine Falls, 20 Sep 1978, A. Neboiss (NMV, T-6194). Type seen.

Paratypes. 35 males, 35 females (specimens CT-026 male, CT-113 female figured), collected with holotype (ANIC, BM, NMV, WAM). Type material was examined and new figures drawn from the paratypes.

Other material examined. Western Australia. (localities published by Neboiss, 1982).

South Australia. 10 males, Murray R., Wombat Flat Billabong, S of Morgan, 19 Jan 1983, A.W.

Victoria. 48 males, Wyperfield Nat. Pk, L Werrebean, 6 Apr 1977, J.B.; 1 male, Wimmera R. upstream Horsham, 18 Nov 1985, Invertebrate Studies Unit RWC; 21 males, Royal Botanic Gardens, *Nymphaea* lily lake, 15 Mar 1986, K.L. Walker; 1 male, Yarra R., Burnley Plant Research Inst., 15 Nov 1976; 1 male, Bobs Pond Causeway, 5 km W of Emerald, 23 Aug 1980, D. Cartwright; 1 male, Sugarloaf Res., 28 Nov 1984, J. Dean; 2 males, same loc., 13 Jan 1986, D. Cartwright; 2 males, same loc., 20 Jan 1986, D. Cartwright; 1 male, Tyers R. on Yallourn North-Tyers Rd, 38°8.9'S, 146°27'E, 12 Nov 1980, Latrobe C Survey; 1 male, ITR/ Morwell R. jn, LRES site 8, 22 Feb 1974; 1 male, Traralgon Ck, Traralgon, 13 Feb 1973; 1 male, GGS Timbertop nr Merrigig, 30 Nov 1957, J. Landy; 1 male, same loc., 20 Dec 1957, Edwards; 2 males, Ovens R., Porepunkah, 1 Dec 1979, A.W., Bailey; 1 male, 10 km NW of Eskdale, 4 Nov 1976, A.A. Calder.

New South Wales and ACT. 1 male, Murrumbidgee R., Balranald, 34°38'S, 143°34'E, 6 Jan 1982, G. Bennison; 1 male, Lees Ck, Brindabella Range, ACT, 26 Nov 1977, G. Daniels.

Queensland. 1 male, South Pine R., 8 km W of Samford, 21 Oct 1980, A.N.; 1 male, Gregory R. crossing nr Goodwood, 24 Aug 1977, K.J. Lambkin; 1 male, Eungella Nat. Pk, Broken R. at camping ground, 24 Apr 1979, A.W.

Northern Territory. 3 males, Todd R., 9 km NE of Alice Springs, 23°38'S, 133°53'E, 28 Sep 1978, J.C. Cardale (ANIC).

Description (revised after Neboiss, 1982). Wings fawn to brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view broadbased, length about 2× maximum width, tapered strongly distally, a digitiform projection present on ventral margin near base (Fig. 10). Inferior appendage in ventral view, length about 2.5× width, tapered distally (Fig. 11), with a slender dorsally-directed, digitiform projection at apex. In lateral view, paramere slender, gradually depressed distally; phallus produced into a short projection (Fig. 10).

Female. Genitalia (Figs 97, 98): ventral plate subquadrate with small lateral-facing "pocket" formed by overhang, situated near baso-mesal angle. Ventral plate slightly concave immediately lateral and distal to "pocket".

Length of anterior wing: male 4.3–6.0 mm, female 4.7–6.5 mm.

Distribution. S-WA, SE-SA, Vic., NSW, E-Qld, S-NT (Fig. 110).

Remarks. A widespread species throughout the southern half of Australia. The male resembles

E. digrutus sp. nov., in the shape of the superior and inferior appendages, but can be separated by small differences in all genitalic characters.

Ecnomus digrutus sp. nov.

Figures 12, 13

Type material. Holotype male, Western Australia, Fine Springs Ck on road between L Argyle Tourist Village and Duncan Hwy, 23 Feb 1977, J.E. Bishop (NMV, T-10043).

Paratypes. 2 males (specimen CT-067 figured), collected with holotype (NMV).

Other material examined. Western Australia. 2 males, Camp Ck, Mitchell Plateau, 31 Jan 1978, J.E.B.; 1 male, Mitchell Plateau, 30 Jan 1978, J.E.B.

Northern Territory. 2 males, ARRS Radon Springs, 13–14 Apr 1988, A.W., P.S.

Description. Male. Wings pale reddish-brown. Genitalia in lateral view with superior appendage broadbased, tapered strongly distally, maximum width in distal third about 1/6 maximum width in basal third, a slender digitiform projection present on ventral margin near base (Fig. 12). Inferior appendage in ventral view, length about 3× width, inner margin with two shallow excisions, one in basal half, second in distal 1/4 (Fig. 13), with a subapical, dorsally-directed digitiform projection. In lateral view, paramere slender, apex slightly dilated; phallus produced into a slender point (Fig. 12).

Female. Unknown.

Length of anterior wing: male 3.6–3.8 mm.

Etymology. *Digrutus* – anagram of *turgidus*.

Distribution. N-WA (Kimberley region), N-NT (Fig. 112).

Remarks. The male is similar to *E. turgidus* in having projections on both the superior and inferior appendages, but differs in the shape. *E. digrutus* is a rare northern Australian species.

Ecnomus woronan sp. nov.

Figures 14, 15

Type material. Holotype male, Western Australia, Camp Ck at crusher, Mitchell Plateau, 15 Feb 1979, J.E. Bishop (NMV, T-10046).

Paratypes. 8 males (specimen CT-078 figured), collected with holotype (NMV).

Other material examined. Western Australia. 1 male, Mitchell Plateau, 30 Jan 1978, J.E.B.; 1 male, same loc., 14 Feb 1979, J.E.B.; 3 males, Fine Springs Ck on rd between L Argyle Tourist Village and Duncan Hwy, 23 Feb 1977, J.E.B.; 1 male, Fine Springs Ck, 2 Feb 1978, J.E.B.

Northern Territory. 1 male, Devil Devil Ck, 70 km SW of Daly R. Mission, 23 Aug 1979, J.B.; 3 males, South Alligator R., JDDP Falls, 7 Sep 1979, J.B.; 1 male, South Alligator R. nr Koolpin Crossing, 14 Oct 1987, P. Dostine; 2 males, ARRS South Alligator R. above Fisher Ck jn, 24 May 1988, A.W., P.S.; 2 males, same loc., 19–20 Apr 1989, P.S., A.W.; 2 males, ARRS South Alligator R. at Gimbat OSS Station, 24 May 1988, A.W., P.S.; 2 males, ARRS South Alligator R. below BHP camp, 25 May 1988, P.S., A.W.; 1 male, ARRS South Alligator R. below Fisher Ck jn, 24 May 1988, A.W., P.S.; 3 males, SAR site 1, various dates 1988, P. Dostine; 2 males, ARRS Radon Springs, 18–19 May 1988, P.S., A.W.; 1 male, Graveside Ck, 18 Jul 1988, P. Dostine; 2 males, Graveside Gorge, 18 Jul 1988, P. Dostine; 1 male, ARRS Bowerbird Billabong inlet, 1 Oct 1988, P. Dostine; 3 males, ARRS Ck 5 km W of OSS Gimbat Field Station, 19 Apr 1989, A.W., P.S.; 2 males, SAR, Rock Hole Ck, November 1988, P. Dostine; 2 males, Gulungul Ck inlet to Gulungul Billabong, 20 Apr 1989, A.W., P.S.; 1 male, ARRS Kamboolge Ck, 25–26 May 1988, A.W., P.S.; 6 males, same loc., 25 May 1988, A.W., P.S.; 1 male, Goanna Lagoon, 1 km W of Jabiru off Arnhem Hwy, 28 Jan 1980, R. Marchant; 1 male, 16 km NE of Mt Cahill, 12°50'S, 132°51'E, 13 Jun 1973, J.C. Cardale (ANIC).

Queensland, 2 males, Crystal Ck, Mt Spec tunnel, 2 May 1979, A.W.

Description. Male. Wings pale lawn to brown. Genitalia with superior appendage in lateral view, length about 3× width, tapered slightly distally (Fig. 14). Inferior appendage in ventral view, short and robust, length about 2× width, apex rounded, with a broadbased mesal projection at about the middle and a second projection subapically (Fig. 15). In lateral view, paramere short, robust; phallus obliquely narrowed subapically (Fig. 14).

Female. Unknown.

Length of anterior wing: male 3.3–4.0 mm.

Etymology. Named after the Woronan language of the aboriginal tribe who inhabited the region around the type locality.

Distribution. N-WA (Kimberley region), N-NT, NE-Qld (Fig. 114).

Remarks. The basic form of the inferior appendages is similar to *E. kakaduensis* sp. nov., and *E. tridigitus* sp. nov., but the shape differs. Two male specimens have been collected from Mt Spec, NE-Queensland which differ from the type material in the shape of the inferior appendages. The mesal projections are less prominent (Fig. 15a). The form of other genital structures agree with the type specimen (Fig. 14a). There is also one male specimen from the Mitchell Plateau in

N-Western Australia (specimen CT-064), which although slightly damaged, is similar to the Mt Spec specimens.

Enomus kakaduensis sp. nov.

Figures 16, 17

Type material. Holotype male, Northern Territory, Radon Ck, Kakadu Nat. Pk, 3 Sep 1979, J. Blyth (NMV, T-10055).

Paratypes. 2 males (specimen CT-066 figured), collected with holotype (NMV)

Other material examined. Northern Territory. 1 male, 16 km NE of Mt Cahill, 12°50'S, 132°51'E, 13 Jun 1973, J.C. Cardale (ANIC); 1 male, Graveside Ck, 18 Jul 1988, P. Dostine; 3 males, ARRS Graveside Gorge, 18 Jul 1988, P. Dostine.

Western Australia. 1 male, Camp Ck, Mitchell Plateau, 13 Jul 1978, P.S.; 1 male, same loc., 20 Jul 1978, P.S.; 1 male, trib. Camp Ck, Mitchell Plateau, 19 Jul 1978, P.S.

Description. Male. Wings lawn to brown. Genitalia with superior appendage in lateral view, broadest in basal half, tapered gradually distally (Fig. 16). Inferior appendage in ventral view, rounded apically, length about 3× width, with mesal digitiform projections medially and subapically (Fig. 17). In lateral view, paramere gradually depressed distally, apex truncated (Fig. 16). Phallus obliquely narrowed distally, slightly dorso-ventrally compressed (Figs 16, 17).

Female. Unknown.

Length of anterior wing: male 3.8–4.1 mm.

Etymology. Named after the type locality (Kakadu National Park).

Distribution. N-NT, N-WA (Kimberley region) (Fig. 113).

Remarks. The form of the inferior appendages is similar to *E. woronan* and *E. tridigitus* sp. nov., but *E. kakaduensis* differs slightly in shape. The species is uncommonly recorded from northern Australia.

Enomus wellsae sp. nov.

Figures 18, 19, 101, 102

Type material. Holotype male, New South Wales, Severn River, 29°28.3'S, 151°29'E, 23 Oct 1981, Wells and Carter (NMV, T-10058).

Paratypes. 10 males, 1 female (specimens CT-017 male, CT-097 female figured), collected with holotype (NMV).

Other material examined. New South Wales. 1 male, Wilson R., NW Wauchope, 31°14'S, 152°34'E, 30 Oct 1981, A.W., Carter.

Queensland. 1 male, Cunninghams Gap, 3 Dec 1982, G. Theischinger; 5 male, Booloumba Ck, 8 km SW Kenilworth, 26°39'S, 152°39'E, 12 Dec 1984, G. Theischinger; 1 male, same loc., 12 Jan 1986, G. Theischinger; 1 male, Mothar Mt, 12 km SE Gympie, 29 Oct 1980, A.N.; 1 male, Granite Ck, 210 m, Bulburin State Forest via Many Peaks, 1 Apr 1972, S.R. Monteith (ANIC); 3 males, Cathay Ck, Eungella, 25 Apr 1979, A.W.; 2 males, Broken R., Eungella Range, Mackay rainforest, 9 Jun 1971 (QM); 3 males, Upper Ross R., below weir SW of Townsville, 8 May 1979, A.W.; 6 males, Alice R., Hervey Range Rd, 25 km W of Townsville, 9 May 1979, A.W.; 1 male, Millstream Falls, W of Ravenshoe, 25 Jun 1971, E.F. Rick (ANIC).

Description. Wings brown to dark greyish-brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view long, stout, tapered slightly distally, with downwardly produced basiventral angle (Fig. 18). Inferior appendage in ventral view, with basal half broad, two small mesal projections, one medial and the second positioned distally (Fig. 19). In lateral view, paramere robust, gradually depressed distally, with truncate apex; phallus with shallow ventral subapical swelling (Fig. 18), but with obvious spine embedded in ventral surface subapically (Fig. 19).

Female. Genitalia (Figs 101, 102): ventral plate with obvious notch in distal margin, with slender elongate, lateral-facing "pocket" near mid-mesal margin formed by an overhang, ventral plate deeply concave lateral to "pocket".

Length of anterior wing: male 4.3–6.3 mm, female 6.1 mm.

Etymology. Named for Dr Alice Wells (collector).

Distribution. NE-NSW, E-Qld (Fig. 113).

Remarks. The male can be readily identified by the triangular shape of the inferior appendages. The female can be distinguished by the long, slender "pockets".

Ecnomus tridigitus sp. nov.

Figures 20, 21, 91, 92

Type material. Holotype male, New South Wales, Beltinger River, 30°26'S, 152°44'E, 31 Oct 1981, Wells and Carter (NMV, T-10070).

Paratypes. 12 males, 1 female (specimens CT-012♂, CT-099♀ figured), collected with holotype (NMV).

Other material examined. New South Wales. 1 male, Coxs R. on Coxs R. Rd, 10 km S of Lithgow, 4 Nov 1981, A.W., Carter; 1 male, Allyn R., NE of Eccleston, 3 Nov 1981, A.W., Carter; 41 males, Boyd R., 5

km E of Dalmerton on Old Grafton Rd, 27 Oct 1981, A.W., Carter; 34 males, Styx R. Forest camp in Styx R. State Forest, 28 Oct 1981, A.W., Carter.

Queensland. 4 males, Obi Obi Ck, 8 km SW of Mapleton, 23 Oct 1980, A.N.; 2 males, Yabba Ck, 10 km W of Imbil, 26 Oct 1980, A.N.; many males, Glastonbury Ck, 15 km W of Gympie, 27 Oct 1980, A.N.; 1 male, Emu Ck State Forest nr Benarkin, 26°53'S, 152°08'E, 15 Jan 1986, G. Theischinger.

Description. Wings brown to dark greyish-brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view long, broadest in median section, narrowed in distal 1/4, apex inclined downwards, ventral margin weakly serrate (Fig. 20). Inferior appendage in ventral view, length about 3× width, with two subapical projections and apex produced into a digitiform process (Fig. 21). In lateral view, paramere robust, straight distally; phallus without ventral subapical swelling (Fig. 20), with a pair of large curved spines embedded in ventral surface subapically (Fig. 20).

Female. Genitalia (Figs 91, 92): ventral plate with outside margin rounded, tapered distally, with rounded distal-facing "pocket" near mesal margin in basal third, formed by an overhang.

Length of anterior wing: male 4.1–5.2 mm, female 5.2 mm.

Etymology. *Tridigitus* (Latin) three fingers (inferior appendage).

Distribution. E-NSW, SE-Qld (Fig. 111).

Remarks. In the male, the structure of the inferior appendages is similar to *E. woronan* and *E. kakaduensis*, but can be distinguished by the distinctive narrowing of the superior appendages.

Ecnomus neboissi sp. nov.

Figures 22, 23

Type material. Holotype male, Victoria, Genoa River near Wangarabell, 18 Mar 1977, A. Neboiss (NMV, T-10084, figured specimen CT-031).

Other material examined. Queensland. 1 male, Girraween Nat. Pk nr Wyberba, 10 Oct 1973, A.N.

Description. *Male.* Wings greyish-brown with paler irrorations. Genitalia with superior appendage in lateral view long, length about 4× width, ventral margin weakly crenulate (Fig. 22), in ventro-lateral view basiventral angle is downwardly and mesally produced into a broad projection (Fig. 22a). Inferior appendage in ventral view robust, length about 2× width, with two subapical projections and apex produced into a digitiform process (Fig. 23). In lateral view,

paramere broad, gradually depressed distally, apex dilated and curved downwards at right angles to form a distinct hook; phallus obliquely narrowed subapically (Fig. 22), with two short spines embedded in ventral surface (Fig. 23).

Female. Unknown.

Length of anterior wing: male 5.6–5.7 mm.

Etymology. Named after Dr Arturs Neboiss (collector).

Distribution. E-Vic., SE-Qld (Fig. 111).

Remarks. *E. nevoissi* can be readily identified by the distinctive form of the inferior appendages. Only two specimens are known and have been collected from widely separated localities.

Ecnomus turrbal sp. nov.

Figures 24, 25

Type material. Holotype male, Queensland, Brisbane River nr Kholo, 9 Mar 1973, M.H. Colbo (NMV, T-10085).

Paratypes. 5 males (specimen CT-041 figured), collected with holotype (NMV).

Other material examined. Queensland. 1 male, Brisbane R., Kholo, 12 Oct 1972, M.H. Colbo; 1 male, Kenmore nr Brisbane, 8 Jan 1977, G. Daniels; 3 males, Glastonbury Ck, 15 km W of Gympie, 27 Oct 1980, A.N.; 4 males, Paluma Dam, 12–13 May 1980, I.D. Naumann, J.C. Cardale (ANIC); 35 males, Upper Ross R. below weir SW of Townsville, 8 May 1979, A.W.; 3 males, Alice R., Hervey Range Rd. 25 km W Townsville, 9 May 1979, A.W.; 1 male, Stoney Ck on Mt Stuart Rd, Townsville, 27 Apr 1979, A.W.; 1 male, Tinaroo Pines Caravan Park, 9 Apr 1972, N. McFarland; 8 males, Tinaroo Dam, November 1982, G. Theischinger; 3 males, Downfall Ck, Tinaroo Falls Dam, 22 May 1980, I.D. Naumann, J.C. Cardale (ANIC).

Northern Territory. 3 males, Adelaide R., 15 km E of Mt Stuart Hwy, 15 Aug 1979, J.B.; 17 males, ARRS Kambolgie Ck, 25 May 1988, P.S., A.W.

Description. Male. Wings fawn to brown. Genitalia with superior appendage in lateral view broader in basal half, tapered distally with slightly dilated apex (Fig. 24). Inferior appendage in ventral view, length about 4× width, apex with two-pronged or bifid appearance (Fig. 25), in lateral view broad in median section, length about 2× width; paramere robust, gradually depressed distally, apex slightly dilated, curved downwards to form a hook; phallus without a distinct ventral subapical swelling (Fig. 24).

Female. Unknown.

Length of anterior wing: male 4.0–5.0 mm.

Etymology. Named after the Turrbal aboriginal tribe who inhabited the region encompassing the type locality.

Distribution. E-Qld, N-NT (Fig. 111).

Remarks. The male is similar to *E. cuspidis* sp. nov. and *E. bishopi* sp. nov. in having inferior appendages broad in lateral view. The bifid apices of the inferior appendages in *E. turrbal* are diagnostic.

Ecnomus cuspidis sp. nov.

Figures 26, 27

Type material. Holotype male, Queensland, Upper Ross River below weir, SW of Townsville, 8 May 1979, A. Wells (NMV, T-10091).

Paratypes. 2 males (specimen CT-073 figured), collected with holotype (NMV).

Other material examined. Western Australia. 2 males, Ord R. below dam, 21 Feb 1977, J.E.B.; 1 male, Spillway Ck, 2 Feb 1978, J.E.B.; 1 male, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 1 male, stream opposite Deadhorse Gap, L Argyle, 19 Feb 1977, J.E.B.; 6 males, Granite Ck, Kununurra–L Argyle Hwy, 2 Feb 1978, J.E.B.

Northern Territory. 1 male, Daly Waters, 15 May 1976, Carnaby; 3 males, Howard Springs, 9 Sep 1980, D. King; 2 males, Jim Jim Ck on Kakadu Hwy, 28 May 1988, A.W., P.S.; 5 males, Magela Ck, various sites, dates and collectors; 8 males, ARRS Ranger Mine, RP1 and RP2, various dates and collectors; 1 male, Georgetown Billabong nr Jabiru, 13 Jul 1983, A.J. Sharley; 6 males, Goanna Lagoon, 1 km W of Jabiru off Arnhem Hwy, various dates 25 Apr 1979–30 Aug 1979, R. Marchant; 1 male, Coonjimba Billabong, 19 May 1988, P.S., A.W.; 4 males, ARRS Gulungul Ck, inlet to Gulungul Billabong, various dates, A.W., P.S.; 1 male, 5 km NNW of Cahills Crossing (E Alligator R.), 12°23'S, 132°57'E, 8–9 Jun 1973, J.C. Cardale (ANIC); 2 males, ARRS E Alligator R. at Cahills Crossing, 27 May 1988, A.W., P.S.; 1 male, 36 km SW of Borroloola, 16°19'S, 136°05'E, 4 Nov 1975, J.C. Cardale (ANIC).

Queensland. 2 males, swamp 28 km N Laura, 30 Nov 1974, Moulds; 4 males, Tinaroo Dam, Nov 1982, G. Theischinger; 3 males, Tinaroo Dam (nr Kairi Ck), 22 Jun 1971, E.F. Rick (ANIC); 1 male, Tinaroo Pines Caravan Pk, 9 Apr 1972, N. McFarland; 1 male, Downfall Ck, Tinaroo Falls Dam, 22 May 1980, I.D. Naumann, J.C. Cardale (ANIC); 1 male, Glastonbury Ck, 15 km W of Gympie, 27 Oct 1980, A.N.; 1 male, Clintonvale, 14 Oct 1973, A.N.; 1 male, Brisbane R., Kholo, 9 Mar 1973, M.H. Colbo; 1 male, Cunningshams Gap, Western Fall, 28°03'S, 152°24'E, 1 Dec 1984, G. Theischinger.

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view long, stout, length about 3× width (Fig. 26). Inferior

appendage in ventral view, length about 3× width, narrowed slightly in median section, inflected distally, with a dorso-mesally directed digitiform projection apically (Fig. 27), in lateral view broad medially, length about 2× width, sub-trapezoidal in shape, proximal angle of upper margin obtuse, apical projection visible above dorsal margin; paramere with apex turned downwards at right angles to form a distinct hook as in *E. bishopi* sp. nov.; phallus obliquely narrowed subapically (Fig. 26).

Female. Unknown.

Length of anterior wing: male 3.6–4.9 mm.

Etymology. *Cuspidis* (Latin) point (inferior appendages).

Distribution. N-WA (Kimberley region), N-NT, E-Qld (Fig. 115).

Remarks. A slightly variable species, very similar to *E. bishopi* sp. nov., and very difficult to distinguish from it. The sub-trapezoidal shape of the inferior appendage in lateral view, is consistent and different to the trigonal shape in *E. bishopi* sp. nov.

There is slight variation in the shape of the inferior appendage between several larger specimens collected from SE-Queensland and the type material. In the SE-Queensland specimens (Figs 26a, 27a), the inferior appendage in ventral view, length is about 4× width, the distal margin is produced into a swelling (Fig. 27a), in lateral view the apical projection appears to arise from the inferior appendage below the level of the dorsal margin (Fig. 26a), whereas in the type specimens it arises at the level of the dorsal margin (Fig. 26). Only four specimens of the atypical SE-Queensland form have been collected, therefore all specimens are referred to *E. cuspidis* for the present.

Ecnomus bishopi sp. nov.

Figures 28, 29

Type material. Holotype male, Western Australia, Spillway Ck, Ord River Dam, 20 Feb 1977, J.E. Bishop (NMV, T-10095).

Paratypes. 1 male (figured specimen CT-079), collected with holotype; 1 male, same loc., 2 Feb 1978, J.E. Bishop; 1 male, Ord River, 9 km N Kununurra, 19 Sep 1978, J. Blyth (NMV).

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view, length about 2.5× width, broadest in basal half, narrowed slightly in median section (Fig. 28). Inferior appendage in ventral view, length about 4× width, narrowed slightly in middle, inflected

distally, with a mesally-directed digitiform process apically (Fig. 29), in lateral view broad, length about 2× width, trigonal in shape, proximal angle of upper margin nearly a right angle, apical projection only just visible above dorsal margin; paramere with apex turned downwards at right angles to form a distinct hook; phallus obliquely narrowed subapically (Fig. 28), as in *E. cuspidis*.

Female unknown.

Length of anterior wing: male 3.7–3.8 mm.

Etymology. Named after Dr J.E. Bishop (collector).

Distribution. N-WA (Kimberley region) (Fig. 115).

Remarks. The male is very similar to *E. cuspidis*. In *E. bishopi* the inferior appendage in lateral view is trigonal in shape, whereas in *E. cuspidis* it is sub-trapezoidal. A rare species as only four males have been collected from two sites.

Ecnomus clavatus sp. nov.

Figures 30, 31

Type material. Holotype male, Northern Territory, Lambells Lagoon, Humpty Doo, 19 Aug 1979, J. Blyth (NMV, T-10096).

Paratypes. 13 males (specimen CT-043 figured), collected with holotype (NMV).

Other material examined. Western Australia. 1 male, Wittenoom Gorge, 5 km S of Wittenoom, 26 Oct 1979, J.B.; 2 males, Millstream, Fortescue R., S of Roebourne, 12 Nov 1978, M.S. and B.J. Moulds; 1 male, Lockyer Gorge, Harding R., Pilbara, 19 Oct 1979, J.B.; 1 male, Gieki Gorge Nat. Pk, 9 Oct 1979, J.B.; 11 males, Mitchell Plateau, various sites, dates and collectors; 1 male, Granite Ck, L Argyle–Kununurra Hwy, 2 Feb 1978, J.E.B.; 5 males, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 6 males, stream opposite Deadhorse Gap, L Argyle, 19 Feb 1977, J.E.B.; 6 males, Ord R. below dam, 21 Feb 1977, J.E.B.; 5 males, Spillway Ck, 2 Feb 1978, J.E.B.; 1 male, Fine Springs Ck on rd between L. Argyle Tourist Village and Duncan Hwy, 23 Feb 1977, J.E.B.; 4 males, Four Mile Ck, 2 Feb 1978, J.E.B.

Northern Territory. 1 male, Jasper Ck, Victoria River Downs Rd, 45 km SSE Timber Ck, 17 Sep 1979, J. Blyth; 32 males, many tribes of S and E Alligator Rivers, Kakadu Nat. Pk, 17–26 May 1988, A.W., P.S.; 1 male, Graveside Gorge, 18 Jul 1988, P. Dostine; 1 male, Nourlangie Ck, 8 km N of Mt Cahill, 12°48'S, 132°42'E, 16–17 Jun 1973, J.C. Cardale (ANIC); 1 male, Nourlangie Ck, 6 km E of Mt Cahill, 12°52'S, 132°46'E, 18 Nov 1972, J.C. Cardale (ANIC); 1 male, Magela Ck, S of Georgetown Billabong, 28 Mar 1983, A.J. Sharley; 6 males, Georgetown Billabong nr Jabiru, various dates 9 Oct 1982–3 Jul 1983, A.J. Sharley; 2 males, Goanna Lagoon, 1 km W Jabiru off Arnhem

Hwy, 25 Apr 1979, R. Marchant; 2 males, same loc., 27 Jun 1979, R. Marchant; 1 male, Cooper Ck, 19 km SE of Mt Borradaile, 9 Nov 1973, D.H. Colless (ANIC).

Queensland. 1 male, Coen R., Coen, 31 Oct 1988, K. Walker; 1 male, Stoney Ck on Mt Stuart Rd, Stuart, Townsville, 27 Apr 1979, A.W.; 1 male, Ross R. at Apex Pk nr Townsville, 11 Apr 1979, A.W.; 1 male, same loc., 26 Apr 1979, A.W.; 9 males, Upper Ross R. below weir, SW of Townsville, 8 May 1979, A.W.; 1 male, Brisbane R. nr Kholo, 9 Mar 1973, M.H. Colbo.

Description. Male. Wings pale fawn to light brown. Genitalia with superior appendage in lateral view broader in basal half, tapered gradually distally (Fig. 30). Inferior appendage longer than superior appendage, long and slender, in ventral view length about 5× width, slightly constricted in median section, with short triangular mesal projection in basal third (Fig. 31). In lateral view, paramere gradually depressed with truncate apex; phallus lacking ventral subapical swelling, with upper apical angle extended into a short point (Fig. 30).

Female. Unknown.

Length of anterior wing: male 3.2–5.0 mm.

Etymology. *Clavatus* (Latin) club shaped (inferior appendages).

Distribution. N-WA, N-NT, E-Qld (Fig. 116).

Remarks. *E. clavatus* is a widespread northern Australian species distinguished by the long and slender form of the inferior appendages.

Enomus deani sp. nov.

Figures 32, 33, 99, 100

Type material. Holotype male, Victoria, Little River, 6 km E of Wulgulmerang, 12 Dec 1976, A. Neboiss (NMV, T-10110).

Paratypes, 6 males (specimen CT-013 figured), collected with holotype (NMV).

Other material examined. Victoria. Many males from many sites in eastern Victoria.

New South Wales. 2 males, Tianjana Falls, NW of Ulladulla, 35°07'S, 153°20'E, 10 Jan 1985, G. Theischinger; 2 males, Crackenback R. nr Thredbo, 14 Feb 1975, T. Petr; 1 male, Thredbo R. at Thredbo, 5–7 Jan 1984, P. Teislyer; 18 males, 1 female (CT-110 female figured), Mt Kosciusko, 21 Feb 1969, A.N.; 3 males, same loc., 2100 m, small trickle, 5 Jan 1984, G. Theischinger; 1 male, same loc., 1500m, 9 Jan 1982, G. Theischinger; 1 male, Diggers Ck, Mt Kosciusko Rd, 13 Feb 1975, T. Petr; 7 males, Perisher Ck nr Perisher, 13 Feb 1975, T. Petr; 1 male, Jindabyne, 21 Feb 1969, A.N.; 1 male, 1 female, Snowy R., 8 Feb 1966, E.F. Riek (ANIC); 1 male, Wragges Ck, 10 Feb 1966, E.F. Riek (ANIC); 1 male, 3 females, Monga, 6 Feb 1966,

E.F. Riek (ANIC); 11 males, 14 females, Brown Mt, 18 Jan 1961, E.F. Riek (ANIC); 2 males, Dilgry R., 19 km NW Rawdon Vale, 31°53'S, 151°32'E, 18 Feb 1980, A.A. Calder; 11 males, Upper Manning R., 20 km NNW Rawdon Vale, 31°52'S, 151°34'E, 19 Feb 1980, A.A. Calder; 7 males, 13 km W of Dorrigo, 22 Feb 1966, E.F. Riek (ANIC); 13 males, Styx R., 12 km S of Ebor, 17 Oct 1973, A.N.; 1 male, Poverty Point, Tenterfield, 22 Feb 1979, E. Dahms (QM).

Description. Wings light brown-darker greyish brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view stout, with downwardly produced basiventral angle (Fig. 32). Inferior appendage in ventral view with basal half broad, a mesal projection medially, apex (Fig. 33), not drawn out as far as in *E. tillyardi*. In lateral view, paramere robust with apex dilated and curved downwards to form a distinct hook; phallus (Fig. 32), similar to *E. tillyardi*.

Female. Genitalia (Figs 99, 100): ventral plate with small lateral-facing "pocket" near mesal margin in basal 1/4, formed by overhang; surface of plate slightly concave immediately lateral and distal to "pocket".

Length of anterior wing: male 5.0–7.7 mm, female 8.3–8.6 mm.

Etymology. Named after Mr John Dean.

Distribution. E-Vic., E-NSW (Fig. 113).

Remarks. The inferior appendages of the male are distinctive, although similar in form to *E. tillyardi* and *E. volsellus* sp. nov. A smaller atypical specimen (CT-036), collected from the Wentworth R., Victoria is partly figured (Figs 32a, 33a). The superior appendage in lateral view, has a downwardly produced basiventral angle extended into an obvious projection (Fig. 32a). The inferior appendage in ventral view (Fig. 33a), is less tapered in the distal half than in the type specimens. The female description and figures are based on a specimen (CT-110), collected from Mt Kosciusko, New South Wales. *E. deani* is, at present, the only species collected from higher altitudes. The female is not included in the type material as it was not collected from near the type locality.

Enomus tillyardi Mosely

Figures 34a, 35a, 103, 104

Enomus tillyardi Mosely in Mosely and Kimmins, 1953: 378, fig. 260. — Jacquemart, 1965: 29. — Neboiss, 1977: 55, figs 243–249. — Neboiss, 1986: 150.

Type material. Holotype male, Tasmania, Cradle Mt, 22 Jan 1917, J.W. Evans (BMNH). Type not seen.

Other material examined. Tasmania. Many males and females including specimens from localities additional to those published by Neboiss, 1977.

South Australia. 1 male, Mosquito Ck, S of Naracoorte Hwy bridge, 22 Nov 1977, P.S.

Victoria. 5 males, 1 female, Stokes R., 8 km N of Dartmoor, 23 Nov 1977, P.S.; 5 males, Wando R., Wando Dale Station, 30 Oct 1977, A.W., P.S.; 1 male, Pigeon Ponds Ck, Nareen, 30 Oct 1977, A.W., P.S.; 4 males, 2 females, L Purrumbete, 23 Feb 1970, E.F. Riek (ANIC); 4 males, 1 female, same loc., 12 Nov 1976, A.N.; 7 males, Gellibrand R., 3 km E of Gellibrand, 26 Jan 1982, A.N., R. StClair; 54 males, Gellibrand R. at Asplin Ck jn, 28 Jan 1982, A.N.; 1 male, Clearwater Ck, 5 km S of Beech Forest, Otways, 3 Jan 1975, L.M.; 8 males, 9 females, Yarrowee R., 2 km W of Inverleigh, 2 Mar 1978, A.N.; 9 males, 2 females, Moorabool R., Meridith, 12 Feb 1959, A.N.; 1 male, Moorabool R., Durdidwarrah Rd, 25 Mar 1953, A.N.; 15 males, Ballan, 4 Nov 1953, A.N.; 4 males 1 female, Clunes, 6 Jan 1956, A.N.; 1 male, Newlyn Res., 25 Nov 1969, E.F. Riek (ANIC); 35 males, 26 females, Coliban R., 6 km SW Kyneton, 18 Feb 1973, A.N.; 1 male, Sunbury, 18 Dec 1953, A.N.; 3 males, Jaeksons Ck, 8 km N of Sunbury, 25 Nov 1952, A.N.; 6 males, 2 females, Jaeksons Ck, Clarkefield, 18 Dec 1953, A.N.; 2 males, 4 females, Plenty R., Sth Morang, 29 Dec 1953, A.N.; 2 males, 3 females, Kangaroo Ground, 18 Dec 1954, A.N.; many males and females, Yarra R., sites between Tarrawarra and nr McMahons Ck jn, various dates 17 Feb 1976–14 Feb 1981, A.N.; 3 males, Woori Yallock Ck, Woori Yallock, 16 Jan 1974, A.N.; many males and females, recorded from streams in eastern Victoria, list of localities from author.

New South Wales. 5 males, Boyd R., 29°50'S, 152°21'E, 11 Feb 1988, G. Theisehinger.

Description (revised after Mosely and Kimmins, 1953; Neboiss, 1977). Wings dark greyish-brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view long, with downwardly produced basiventral angle (Fig. 34a). Inferior appendage in ventral view with basal half broad, mesal projection medial, distal half straight, laterally compressed (Fig. 35a), in lateral view apex slightly dilated; paramere robust with apex curved downwards to form a hook; phallus narrowed subapically with a short apical process (Fig. 34a).

Female. Genitalia (Figs 103, 104): ventral plate long, similar to *E. volsellus* sp. nov., with elongate lateral-facing "pocket" near mesal margin in distal half, formed by overhang, plate deeply concave lateral of "pocket", distal margin bluntly pointed.

Length of anterior wing: male 5.9–7.3 mm, female 6.5–8.5 mm.

Distribution. Tas., SE-SA, Vic., NE-NSW (Fig. 117).

Remarks. *E. tillyardi* is a large, variable species with genitalia similar in form to *E. volsellus* sp. nov. and *E. deani*. The male differs in the shape of the apex of the inferior appendage especially in lateral view. The form of the genitalia is very uniform in Tasmanian males. Twelve male specimens have been collected from SE-South Australia and western Victoria (Fig. 34c), which are very similar to Tasmanian specimens in the shape of the inferior appendage. In males collected progressively further east, the distal half of the inferior appendage tends to be more slender and the apex more upturned (Figs 34d–f, b). The paramere also changes correspondingly from the bulbous, straight form found in Tasmanian specimens to the more slender, hooked shape in eastern Victorian ones (Fig. 34b). Hence there appears to be a cline extending for about 450 km across Victoria (Fig. 117). In eastern Victorian female specimens (Figs 103a, 104a), the "pockets" on the ventral plate are more slender than in Tasmanian specimens (Figs 103, 104). Future work may prove otherwise, but for the present all SE-South Australian, Victorian and New South Wales variants are placed in *E. tillyardi*. The only example of male and female *Ecnomus* preserved in copula has been collected from the Yarra River and is illustrated to show the "key in lock" pairing formed during copulation (Figs 107, 108).

Ecnomus volsellus sp. nov.

Figures 36, 37, 38, 105, 106

Type material. Holotype male, Victoria, Genoa River nr Wangarabell, 18 Mar 1977, A. Neboiss (NMV, T-10142).

Paratypes. 20 males (specimen CT-014 figured), collected with holotype; 1 female (specimen CT-092 figured), Victoria, Tambo Crossing, 24 Jan 1960, A. Neboiss (NMV).

Other material examined. Victoria. Many males collected from numerous localities in eastern Victoria.

New South Wales. 3 males, Mumbulla Ck, 15 km NE Bega, 19 Mar 1979; 5 males, McLaughlin R. nr Ando, 20 Nov 1965, A.N.; 5 males, 3 females, same loc., 4 Nov 1966, E.F. Riek (ANIC); 13 males, Haeking R., Royal Nat. Pk nr Sydney, 2 Oct 1985, A.N.; 22 males, Coxs R. on Coxs R. Rd, 10 km S of Lithgow, 4 Nov 1981, A.W., Carter; 1 male, Molong, 29 Dec 1973, M.S. Moulds; 2 males, Blandford, 8 Dec 1976, Moulds; 2 males, Upper Allyn R., 12 km N of Eccleston, 21 Feb 1980, A.A. Calder; 3 males, Terania Ck. N of Lismore, 28°25'S, 153°18'E, 21 Jan 1986, G. Theisehinger; 1 male, Styx R. at forest camp, Styx R. State

Forest, 28 Oct 1981, A.W., Carter; 3 males, 3 females. Gara R., 20 Feb 1966, E.F. Riek (ANIC); 1 male, Wilson R., NW Wauchope, 31°14'S, 152°34'E, 30 Oct 1981, A.W., Carter; 60 males, Apsley R. at falls, SE of Walcha, 29 Oct 1981, A.W., Carter; 1 male, Blue Hole, Gyra R., 30°36'S, 151°48'E, 7 Feb 1987, G. Theischinger; 6 males, 3 females, Bakers Ck Falls nr Armidale, 30°35'S, 151°54'E, 6 Feb 1987, G. Theischinger; 17 males, Boonoo Boonoo R., 5 km upstream falls, 11 Oct 1973, A.N.; 2 males, same loc., 29 Nov 1981, G. Daniels, M.A. Schneider (ANIC).

Queensland, 11 males, Cunninghams Gap, Western Fall, 28°03'S, 152°24'E, 1 Dec 1984, G. Theischinger; 2 males, Girraween Nat. Pk nr Wyberba, 10 Oct 1973, A.N.; 2 males, Fletcher, 14 km SSW of Stanthorpe, 16 Jan 1969, E. Dahms (QM); 2 males, same loc., 30 Mar 1971, E. Dahms (QM); 4 males, 2 females, Goomhurra State Forest, NE of Warwick, 28°03'S, 152°07'E, 20 Jan 1986, G. Theischinger; 1 male, Mt Tamborine, 8 Jan 1975, M.S. Moulds.

Description. Wings brown to darker greyish-brown with paler irrorations, wing venation similar to other Australian species. In forewing (Fig. 38), footstalk of fork R1 longer than in *E. veratus*.

Male. Genitalia with superior appendage long, in lateral view straight, with downwardly produced basiventral angle (Fig. 36). Inferior appendage in ventral view with basal half broad, mesal projection at the middle, distal half tapered apically, inflexed (Fig. 37), and directed slightly dorsally. In lateral view, paramere robust, with apex curved downwards to form a hook; phallus (Fig. 36), similar to *E. tillyardi*.

Female. Genitalia (Figs 105, 106): ventral plate similar in form to *E. tillyardi*, long with elongate, lateral-facing "pocket" near mesal margin in distal half, formed by overhang, plate deeply concave lateral to "pocket", distal margin rounded.

Length of anterior wing: male 5.7–7.7 mm, female 7.4 mm.

Etymology. *Volsellus* (Latin) pineers (inferior appendages).

Distribution. E-Vic., E-NSW, SE-Qld (Fig. 112).

Remarks. *E. volsellus* is a large species which can be grouped with *E. tillyardi*. In the male the long, inflexed inferior appendages are distinctive.

Enomus pansus Neboiss

Figures 39, 40, 87, 88

Enomus pansus Neboiss, 1982: 288, figs 21–23. — Neboiss, 1986: 150.

A male, identified and figured as *E. continentalis*

Ulmer by Mosely and Kimmins (1953: 380, fig. 261), should be referred to this species.

Type material. Holotype male, Western Australia, Frankland River, Circular Pool, 6 km NE of Walpole, 27 Nov 1978, A. Neboiss (NMV, T-6165).

Paratypes, 35 males, 8 females (specimen CT-027 male figured), collected with holotype (ANIC, BM, NMV, WAM). Type material was examined and new figures drawn from paratype male.

Other material examined. The list of localities is available from the author.

Description (revised after Neboiss, 1982). Wings pale fawn to light brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view long and narrow, length about 6× width, apex slightly dilated (Fig. 39). Inferior appendage in ventral view, length about 2.5× width, apex pointed, slightly inflexed, with a subapical digitiform mesal projection at about distal third (Fig. 40). In lateral view, paramere broadbased, slender and gradually depressed in distal half; phallus obliquely narrowed with a long projection apically (Fig. 39).

Female. Genitalia (Figs 87, 88): ventral plate with small rounded "pocket" or pit near meso-basal angle, inserted into the surface of the plate, which is slightly concave particularly in meso-distal area.

Length of anterior wing: male 4.2–6.0 mm, female 5.0–7.0 mm.

Distribution. S-WA, SA, Vic., NSW, Qld, NT (Fig. 114).

Remarks. *E. pansus* is a common and widespread species, where the male is easily identified by the long, slender superior appendages.

Enomus cygnitus Neboiss

Figures 41, 42, 89, 90

Enomus cygnitus Neboiss 1982: 288, figs 18, 19. — Neboiss 1986: 150.

Type material. Holotype male, Victoria, Swan Lake, 30 km NW of Portland, 27 Feb 1976, P.A. Meyer (NMV, T-6670). Type seen.

Other material examined. South Australia, (localities published by Neboiss, 1982).

Victoria, 5 males, 1 female (specimen CT-096 female figured), Wannon R., Nigretta Falls, 6 Dec 1983, A.N.; 17 males (specimen CT-025 figured), L. Fyans, E of Grampians, 15 Mar 1973, A.N.; numerous males, from many lakes, reservoirs and streams (list of localities from author).

Tasmania, 5 males, West Bay R., Margate, 6 Jan 1977, A.N., P. Allbrook; 7 males, L. Fiddler, Lower

Gordon R., 13 Dec 1977, D. Coleman; 1 male, Carlton R., Carlton, 26 Dec 1975, M. Davies; 1 male, Scots Peak dam, Serpentine Impoundment, 23 Mar 1985, Greenslade and Rounsevell; 1 male, L. Pedder, site J, December 1977, P.S. Lake.

New South Wales, 1 male, Khancoban Pondage, 14 Feb 1975, T. Petr; 1 male, Towamba R. nr Kiah, 11 Feb 1975, T. Petr; 1 male, Severn R., 29°28.3'S, 151°29'E, 23 Oct 1981, A.W., Carter.

Queensland, 1 male, Manchester Dam Spillway, N of Ipswich, 1 Feb 1973, M.H. Colbo; 1 male, Gregory R. crossing nr Goodwood, 24 Aug 1977, K.J. Lambkin.

Description (revised after Neboiss, 1982). Wings fawn-pale brown with paler irrorations.

Male. Genitalia with superior appendage in lateral view long, stout, length about 3× width, slightly narrowed from about middle (Fig. 41). Inferior appendage in ventral view, length about 3× width, with a subapical mesal projection at about the middle separated widely from the apical angle (Fig. 42). In lateral view, paramere broadbased, slender and slightly depressed in distal half; phallus obliquely narrowed subapically (Fig. 41).

Female. Genitalia (Figs 89, 90): ventral plate, form similar to *E. pansus*, with rounded "pocket" or pit near meso-basal angle, inserted into the surface of the plate which is slightly concave especially in meso-distal area.

Length of anterior wing: male 4.0–6.5 mm, female 7.1 mm.

Distribution. SE-SA, Tas., Vic., E-NSW, E-Qld (Fig. 116).

Remarks. This species is common, widespread and slightly variable. There is some variation particularly in the shape of the inferior appendages of the male, throughout the distribution range. In Queensland and northern New South Wales specimens (Fig. 42a; Neboiss, 1978: figs 10, 11), the inferior appendage in ventral view is robust, length about twice width, the distal outer margin is produced into a noticeable swelling, and the distance between the mesal subapical projection and the apical angle is about equal to the depth of the concavity between them i.e. the concavity is relatively deep. In Tasmanian specimens (Fig. 42b; Neboiss, 1977: figs 255, 256), the inferior appendage in ventral view is more slender, length about 3× width, the distal outer margin is smoothly rounded, and the distance between the mesal subapical projection and the apical angle is about 3× the depth of the concavity between them i.e. the concavity is relatively shallow. The SE-South Australian, Victorian and SE-New South Wales specimens are inter-

mediate in these characters. Only a few specimens have been collected of the SE-Queensland, NE-New South Wales and Tasmanian variants, hence all specimens are referred to *E. cygnitus* for the present.

Ecnomus kerema sp. nov.

Figures 43, 44

Type material. Holotype male, Queensland, Yuccabine Ck, Kirrama State Forest, 18°12'S, 145°54'E. February 1986, R. Pearson and L. Benson (NMV, T-10164, figured specimen CT-103).

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view with downwardly directed basiventral angle produced into broad swelling, length about 3× width (Fig. 43). Inferior appendage in ventral view, length about 2.5× width, with digitiform mesal projection situated close to the apex (Fig. 44). In lateral view, paramere with apex elongate, curved downwards at right angles to form a pronounced hook; phallus obliquely narrowed (Fig. 43), similar to *E. continentalis*.

Female. Unknown.

Length of anterior wing: male 4.2 mm.

Etymology. Named after the Kerema aboriginal tribe who inhabited the region including the type locality.

Distribution. NE-Qld (known only from type locality) (Fig. 118).

Remarks. This species is known from only one male specimen which is similar to *E. continentalis*, especially in the shape of the inferior appendages, but differs significantly in the shape of the parameres.

Ecnomus continentalis Ulmer

Figures 45, 46, 93, 94

Ecnomus continentalis Ulmer, 1916: 10, figs 12–14. — Mosely and Kimmins, 1953: 380, fig. 261. — Neboiss, 1977: 56, figs 255, 256. — Neboiss, 1978: 830, figs 10, 11. — Neboiss, 1982: 286, figs 16, 17. — Neboiss, 1986: 150.

A male specimen from South Australia, identified and figured as *E. continentalis* by Mosely and Kimmins (1953), should be referred to *E. pansus*.

Specimens PT-458 (Tasmania) and PT-557 (SE-Queensland), identified and figured as *E. continentalis* by Neboiss (1977, 1978) should be referred to *E. cygnitus*.

Type material. Lectotype male (designated by Neboiss, 1982), Queensland, Malanda, date unknown, Mjöberg (NRS). Type not seen.

Lectoparatypes 3 males, same locality (NRS).

Other material examined. Northern Territory, 2 males, Reedy Rockhole, George Gill Range, 24°22'S, 131°45'E, 30 Dec 1986, J.A. Davis. Remaining list of localities available from author.

Description (revised after Neboiss, 1982). Wings light brown to dark greyish-brown with paler irrorations.

Male. Genitalia with superior appendage long, in lateral view stout, length about 3× width, with downwardly produced basiventral angle (Fig. 45). Inferior appendage short, robust, in ventral view length about 1.5× width, with mesal digitiform projection situated close to the apex (Figs 46, 46a). In lateral view, paramere with apex curved downwards at right angles to form a distinct hook; phallus obliquely narrowed subapically, with a short process apically (Fig. 45).

Female. Genitalia (Figs 93, 94): ventral plate with small lateral-facing "pocket" near mesal margin in basal third, formed by overhang. Surface of plate concave disto-laterally of "pocket". Margin of plate with obvious notch in disto-lateral corner.

Length of anterior wing: male 5.0–6.7 mm, female 5.4 mm.

Distribution. SE-SA, Vic., E-NSW, E-Qld, S-NT (Fig. 118).

Remarks. *E. continentalis* is a very common and widespread species. The male is similar to *E. kerema* but differs slightly in the form of the inferior appendages and parameres.

***Ecnomus nibbor* sp. nov.**

Figures 47, 48, 95, 96

Type material. Holotype male, Victoria, Mitchell River near Tabberabbera, 30 Dec 1975, collector unknown (NMV, T-10165).

Paratypes. 3 males (specimen CT-016 figured), collected with holotype; 1 female (specimen CT-104 figured), Victoria, Little River, 6 km E of Wulgulmerang, 12 Dec 1976, A. Neboiss (NMV).

Other material examined. Victoria. 3 males, Wellington R., 23 km NNE of Licola on Tamboritha Rd, 25 Feb 1978, NMV Survey Dept; 1 male, Wellington R., 17 km N of Licola, 14 Feb 1977, A.A. Calder; 2 males, Macalister–Barkly R. jn, Lyndon Flat, 6 Dec 1977, NMV Survey Dept; 2 males, jn Macalister–Wellington Rivers, 23 Feb 1978, NMV Survey Dept; 1 male, Wellington–Carey R. jn, 15 Feb 1977, A.A. Calder; 1 male, Mitchell R. nr Tabberabbera, 21 Jan 1976, collector unknown; 1 pharate male, trib. Cann R., Noorinbee North, 21 May 1981, J. Dean, D. Cartwright; 4 males, Genoa R. at Wangarabell, 8 Feb 1980, A.W.

New South Wales. 1 male, Upper Allyn R., 12 km N of Eccleston, 21 Feb 1980, A.A. Calder; 2 males, Glou-

cester R., 9 km SW of Gloucester, 17 Feb 1980, A.A. Calder; 2 males, Wilson R., NW of Wauchope, 31°14'S, 152°34'E, 30 Oct 1981, A.W., Carter.

Description. Wings fawn-light brown with paler irrorations.

Male. Genitalia with superior appendage long, in lateral view stout, tapered slightly apically (Fig. 47). Inferior appendage in ventral view robust, length about 2× width, with a small subapical mesal projection at about distal 1/4 (Fig. 48). In lateral view, paramere with apex curved downwards at right angles to form a distinct hook; phallus with a laterally compressed process apically (Fig. 47).

Female. Genitalia (Figs 95, 96): ventral plate with lateral-facing "pocket" near mesal margin at middle, formed by overhang. Surface of plate concave just disto-laterally of "pocket".

Length of anterior wing: male 4.5–5.8 mm, female 8.2 mm.

Etymology. Named after the aboriginal word for the Mitchell R. near the type locality – *nibbor*.

Distribution. E-Vic., NE-NSW (Fig. 119).

Remarks. The male shows some similarities to *E. karakoi* sp. nov., especially in the form of the inferior appendages, but can be distinguished by differences in the phallus and parameres.

***Ecnomus ancisus* sp. nov.**

Figures 49, 50

Type material. Holotype male, Western Australia, Ord River below dam, 21 Feb 1977, J.E. Bishop (NMV, T-10170).

Paratypes. 2 males (specimen CT-051 figured), collected with holotype (NMV).

Other material examined. Western Australia. 1 male, Spillway Ck, Ord R. Dam, 20 Feb 1977, J.E.B.; 1 male, Spillway Ck, 2 Feb 1978, J.E.B.; 1 male, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 1 male, Four Mile Ck, 2 Feb 1978, J.E.B.; 2 males, Camp Ck at crusher, Mitchell Plateau, 15 Feb 1979, J.E.B.; 1 male, Mitchell Plateau, mining camp, 14°49'S, 125°50'E, 9–19 May 1983, Naumann, Cardale (ANIC); 1 male, Mitchell Plateau, Surveyor Rd, 17 Jul 1978, P.S.; 1 male, Morgan Falls, 15°02'S, 126°40'E, 16–17 Aug 1975, I.F.B. Common, M.S. Upton (ANIC); 1 male, Maggie Ck, 90 km Kununurra–Wyndham, 3 Feb 1978, J.E.B.; 1 male, Charnley R., 16°22'S, 125°12'E, 2 km SW Rolly Hill, 16–20 Jun 1988, I.D. Naumann (ANIC).

Northern Territory. 1 male, Mataranka, 14 Jul 1969, C. Le Souef; 1 male, ARRS South Alligator R. above Fisher Ck jn, 24 May 1988, P.S., A.W.; 2 males, SAR site 1, 14 Jun 1988, P. Dostine; 4 males, same loc., 30 Sep 1988, P. Dostine; 2 males, same loc., Octo-

ber 1988, P. Dostine: 1 male, ARRS Graveside Gorge, 18 Jul 1988, P. Dostine.

Description. Male. Wings pale reddish-fawn. Genitalia with superior appendage in lateral view broadest in basal half, constricted strongly in distal third, with dilated apex (Fig. 49). Inferior appendage in ventral view, length about 3× width, broadest in basal half, before tapering to pointed apex (Fig. 50). In lateral view, paramere moderately slender, depressed distally; phallus with upper apical angle extended to a slender point. Meso-ventral process on segment ten long (Fig. 49).

Female. Unknown.

Length of anterior wing: male 3.9–4.3 mm.

Etymology. *Ancisus* (Latin) cut away (superior appendage).

Distribution. N-WA (Kimberley region), N-NT (Fig. 118).

Remarks. The male is easily identified by the distinctive shape of the superior appendages.

Ecnomus blythii sp. nov.

Figures 51, 52

Type material. Holotype male, Northern Territory, Jasper Ck, Victoria River Downs Rd, 45 km SSE Timber Ck, 17 Sep 1979, J. Blyth (NMV, T-10173).

Paratypes. 2 males (specimen CT-057 figured), collected with holotype (NMV).

Other material examined. Northern Territory, 2 males, Cooper Ck, 19 km SE of Mt Borradaile, 12°06'S, 133°04'E, 9–10 Nov 1972, J.C. Cardale (ANIC); 1 male, same loc., 5–6 Jun 1973, J.C. Cardale (ANIC); 1 male, Goanna Lagoon, 1 km W of Jabiru off Arnhem Hwy, 27 Jun 1979, R. Marchant; 1 male, same loc., 25 Apr 1979, R. Marchant; 1 male, South Alligator R. below BHP camp, 25 May 1988, P.S., A.W.; 1 male, Nourlangie Ck, 12 Apr 1989, A.W., P.S.; 6 males, ARRS Kambolgie Ck, 25 May 1988, A.W., P.S.; 1 male, Jim Jim Ck on Kakadu Hwy, 28 May 1988, P.S., A.W.; 3 males, Gulungul Ck, inlet to Gulungul Billabong, 20 Apr 1989, A.W., P.S.; 2 males, same loc., 11 Apr 1989, A.W., P.S.; 10 males, Muirella Park, 12 Oct 1972, E.F. Riek (ANIC); 1 male, Katherine Gorge, 23 May 1970, J.A.L. Watson (ANIC); 2 males, same loc., 13 Aug 1979, J.B.

Western Australia, 1 male, Ord R. below dam, 21 Feb 1977, J.E.B.; 1 male, Granite Ck, Kununurra–L Argyle Hwy, 2 Feb 1978, J.E.B.; 1 male, Stonewall Ck, 4 Feb 1978, J.E.B.; 3 males, Morgan R., Theda H.S., Kimberleys, 28 Sep 1979, J.B.; 1 male, Kimberley, 6.5 km NW Mt Bell, 17°10'S, 125°17'E, 25–26 Jul 1988, T.F. Houston (WAM).

Description. Male. Wings pale reddish-fawn. Genitalia with superior appendage in lateral

view broadest in basal half, constricted strongly in middle section, maximum width in distal third about 1/4 maximum width in basal half (Fig. 51). Inferior appendage in ventral view, length about 3× width, with concave inner margin, apex rounded, inflected (Fig. 52), and dorso-ventrally flattened. In lateral view, paramere constricted subapically before “hammerhead”-shaped apex; phallus lacking ventral subapical swelling. Meso-ventral process on segment ten long (Fig. 51).

Female. Unknown.

Length of anterior wing: male 3.3–4.1 mm.

Etymology. Named after Mr J. Blyth (collector).

Distribution. N-NT, N-WA (Kimberley region) (Fig. 119).

Remarks. The male is identified by the distinctive narrowing of the superior appendages.

Ecnomus centralis sp. nov.

Figures 53, 54

Type material. Holotype male, South Australia, Scrubby Ck Waterhole, 27°40'S, 140°18'E, 8 Nov 1983, M. Thompson (NMV, T-10176).

Paratypes. 1 male, collected with holotype (genitalia slightly damaged); 1 male (specimen CT-038 figured), Queensland, Diamantina River, Birdsville, 13 May 1975, J. Blyth (NMV).

Other material examined. South Australia, 2 males, 72 km S of Birdsville, Andrewillah Waterhole, 21 May 1975, J.B.; 3 males, Innaminka Crossing, 11 Oct 1987, M. Drewien; 1 male, Marooeutchanie Lake, 10 Oct 1987, M. Drewien.

New South Wales, 1 male, Darling R., Bourke, 8 May 1975, J.B.

Northern Territory, 2 males, Anthonys Lagoon, 16 May 1976, Carnaby; 1 male, Newcastle Waters, 10 km W of Elliot, 10 Aug 1979, J.B.

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view broad-based, tapered gradually distally (Fig. 53). Inferior appendage in ventral view long and slender, with slightly inflected apex extended further than apex of superior appendage (Fig. 54), in lateral view with subapical dorsal digitiform projection in distal quarter. In lateral view, paramere slightly depressed distally with small lateral flange near apex; phallus laterally compressed, lacking ventral subapical swelling (Fig. 53).

Female. Unknown.

Length of anterior wing: male 3.7–4.8 mm.

Etymology. *Centralis* (Latin) central or middle (central Australian distribution).

Distribution. NE-SA, NW-NSW, SW-Qld, S-NT (Fig. 116).

Remarks. The species is recorded from central Australia and is distinguished by the form of the inferior appendages.

Ecnomus myallensis sp. nov.

Figures 55, 56, 85, 86

Type material. Holotype male, Queensland, Myall Ck, 3 km N of Rangemore, S of Bunya Mountains, 15 Oct 1973, A. Neboiss (NMV, T-10179).

Paratypes. 2 males (specimen CT-042 figured), collected with holotype (NMV).

Other material examined. Victoria. 1 male, 1 female (specimen CT-087 female figured), Greenvale Reservoir, ornamental ponds, 24 Feb 1983, D. Cartwright.

Description. Wings light brown with paler irrorations.

Male. Genitalia with superior appendage long, in lateral view stout, length about 3× width, broadest in basal half (Fig. 55), basiventral angle produced into a mesally directed digitiform projection (Fig. 55a). Inferior appendage in lateral view long, narrowed near middle before broadening distally, apex laterally compressed (Figs 55, 56), with small digitiform projection in basal half. In lateral view, paramere robust, gradually depressed and tapered distally; phallus lacking ventral subapical swelling, upper margin produced into a short projection (Fig. 55).

Female. Genitalia (Figs 85, 86): ventral plate lacking "pocket", with central round concave area and obvious ridge near baso-mesal margin. Notch present in outer distal margin.

Length of anterior wing: male 5.1–5.2 mm, female 5.8 mm.

Etymology. Named after type locality (Myall Ck).

Distribution. SE-Qld, C-Vic. (Fig. 116).

Remarks. Five specimens of *E. myallensis* are known, collected from two widely separated localities. The male is distinguished by the form of the inferior appendages. The female description and figures are taken from a specimen (CT-087) collected from Victoria where the male and female have been associated by breeding through from the larva. The female is not included in the type material as it is not from near the type locality.

Ecnomus yabbura sp. nov.

Figures 57, 58

Type material. Holotype male, Western Australia, Morgan River, Theda H.S., Kimberleys, 28 Sep 1979, J. Blyth (NMV, T-10182).

Paratype. 1 male (specimen CT-060 figured), collected with holotype (NMV).

Other material examined. Western Australia. 1 male, Barnett R. Gorge, Barnett Station, Kimberleys, 1 Oct 1979, J.B.; 2 males, Drysdale R., 15°02'S, 126°55'E, 3–8 Aug 1975, I.F.B. Common, M.S. Upton (ANIC); 1 male, Camp Ck at crusher, Mitchell Plateau, 15 Feb 1979, J.E.B.; 1 male, Mitchell Plateau, mining camp, 14°49'S, 125°50'E, 9–19 May 1983, Naumann, Cardale (ANIC); 1 male, Granite Ck, L. Argyle–Kununurra Hwy, 2 Feb 1978, J.E.B.

Northern Territory. 1 male, South Alligator R., UDP Falls, 7 Sep 1979, J.B.; 2 males, ARRS South Alligator R. at Gimbat OSS Station, 28 Apr 1988, P. Dostine; 2 males, SAR, site 1, 14 Jun 1988, P. Dostine; 2 males, same loc., 30 Sep 1988, P. Dostine; 1 male, same loc., October 1988, P. Dostine; 4 males, ARRS Bowerbird Billabong outlet, 1 Oct 1988, P. Dostine; 4 males, ARRS Ck 5 km W of OSS Gimbat Field Station, 19 Apr 1989, A.W., P.S.; 2 males, Graveside Ck, 18 Jul 1988, P. Dostine; 2 males, Caranbirini Waterhole, 13 km SW Borrooloola, 16°16'S, 136°05'E, 3 Nov 1975, J.C. Cardale (ANIC).

Description. Male. Wings pale fawn-light brown. Genitalia with superior appendage long, in lateral view length about 2× width, broadbased, tapered distally. Inferior appendage in lateral view, long and slender, extending beyond apex of superior appendage (Fig. 57), in ventral view broadest in basal half, narrowed in middle before slightly dilated apex, apex dorso-ventrally flattened producing a spatulate appearance (Fig. 58). In lateral view, paramere elongate, broadbased, slender in distal half; phallus obliquely narrowed subapically. Processes of segment ten robust, situated between the bases of the superior appendages (Fig. 57).

Female. Unknown.

Length of anterior wing: male 3.3–4.0 mm.

Etymology. Named after a Western Australian aboriginal word for north—*yabbura* (distribution).

Distribution. N-WA (Kimberley region), N-NT (Fig. 119).

Remarks. The male is identified by the distinctive and long inferior appendages.

***Ecnomus miriwud* sp. nov.**

Figures 59, 60

Type material. Holotype male. Western Australia, Spillway Ck, 2 Feb 1978, J.E. Bishop (NMV, T-10184).

Paratypes 15 males (specimen CT-068 figured), collected with holotype (NMV).

Other material examined. Western Australia. 8 males, Spillway Ck, Ord R. Dam, 20 Feb 1977, J.E.B.; 2 males, same loc., 2 Feb 1978, J.E.B.; 2 males, Ord R. at Kununurra Dam, 22 Feb 1977, J.E.B.; 3 males, Ord R. below dam, 21 Feb 1977, J.E.B.; 6 males, Ord R., 9 km N of Kununurra, 19 Sep 1979, J.B.; 1 male, Fine Springs Ck, 2 Feb 1978, J.E.B.; 8 males, Granite Ck, Kununurra-L Argyle Hwy, 2 Feb 1978, J.E.B.; 3 males, Four Mile Ck, 2 Feb 1978, J.E.B.; 1 male, Stonewall Ck, 4 Feb 1978, J.E.B.; 1 male, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 1 male, stream opposite Deadhorse Gap, L Argyle, 19 Feb 1977, J.E.B.; 1 male, Carson R., 8 km NE of Theda Station, Kimberleys, 1 Oct 1979, J.B.; 1 male, Barnett R. Gorge, Barnett Station, Kimberleys, 1 Oct 1979, J.B.; 1 male, Charnley R., 16°22'S, 125°12'E, 2 km SW Rolly Hill, 16-20 Jun 1988, I.D. Naumann (ANIC).

Northern Territory, 1 male, Katherine R. Gorge Nat. Pk, 13 Aug 1979, J.B.; 1 male, South Alligator R., Coronation Hill, upper site, 4-5 Jun 1988, P. Cranston; 12 males, SAR site 1, various dates 1988, P. Dostine; 2 males, ARRS South Alligator R. below Fisher Ck jn, 24 May 1988, A.W., P.S.; 3 males, ARRS South Alligator R. above Fisher Ck jn, 24 May 1988, A.W., P.S.; 2 males, same loc., 19-20 Apr 1989, P.S., A.W.; 4 males, South Alligator R. nr Koolpin Crossing, 14 Oct 1987, P. Dostine; 1 male, ARRS Ck 5 km W of OSS Gimbat Field Station, 19 Apr 1989, A.W., P.S.; 4 males, Bowerbird Billabong outlet, 1 Oct 1988, P. Dostine; 4 males, ARRS South Alligator R. at Gimbat OSS Field Station, 24 May 1988, A.W., P.S.; 3 males, ARRS Kambolgie Ck, 25 May 1988, A.W., P.S.; 1 male, Bessie Springs, 8 km ESE of Cape Crawford, 16°40'S, 135°51'E, 26 Oct 1975, J.C. Cardale (ANIC); 1 male, 12 km NNE of Borrooloola, 15°58'S, 136°21'E, 1 Nov 1975, J.C. Cardale (ANIC); 1 male, McArthur R., 48 km SSW of Borrooloola, 16°27'S, 136°05'E, 29 Oct 1975, J.C. Cardale (ANIC); 2 males, 36 km SW of Borrooloola, 16°19'S, 136°05'E, 4 Nov 1975, J.C. Cardale (ANIC); 2 males, Surprise Ck, 45 km SSW of Borrooloola, 16°25'S, 136°05'E, 5 Nov 1975, J.C. Cardale (ANIC); 19 males, McArthur R., 16°47'S, 135°45'E, 14 km SW of Cape Crawford, 25 Oct 1975, J.C. Cardale (ANIC); 4 males, 14 km NW of Cape Crawford, 16°34'S, 135°41'E, 6 Nov 1975, J.C. Cardale (ANIC).

Queensland, 1 male, Hann R. Crossing, 76 km N of Laura, 8 Sep 1974, M.S. Moulds.

Description. Male. Wings pale fawn. Genitalia with superior appendage short, in lateral view broadbased, length about 1.5× width, tapered strongly distally, mesal spines extend about

halfway along upper margin (Fig. 59). Inferior appendage short, in ventral view length about 3× width, slightly inflected distally (Fig. 60). In lateral view, paramere long and slender; phallus lacking ventral subapical swelling (Fig. 59).

Female. Unknown.

Length of anterior wing: male 3.1-3.6 mm.

Etymology. Named after the Miriwud aboriginal tribe who inhabited the region including the type locality.

Distribution. N-WA (Kimberley region), N-NT, NE-Qld (Fig. 113).

Remarks. A small species, similar to *E. kitabal* and *E. larakia* sp. nov., in the shape of the superior and inferior appendages, but can be separated by the extension of the mesal spines along upper margin of the superior appendages.

***Ecnomus wagengugurra* sp. nov.**

Figures 61, 62

Type material. Holotype male, New South Wales, Clarence River at Yates Crossing, 26 Oct 1981, Wells and Carter (NMV, T-10200).

Paratype, 1 male (figured specimen CT-062), collected with holotype (NMV).

Other material examined. Queensland, 1 male, Davies Ck nr Mareeba, 27 Oct 1988, K. Walker; 3 males, Annan R., 3 km SW of Black Mt, 15°41'S, 145°12'E, 27 Sep 1980, J.C. Cardale (ANIC); 1 male, same loc., 26-27 Apr 1981, I.D. Naumann (ANIC).

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view broadest in basal half, tapered slightly distally (Fig. 61). Inferior appendage in ventral view slender, length about 4× width, inner margin inflected towards base of apical point (Fig. 62), as in *E. walajandari* sp. nov. In lateral view, paramere long and slender; phallus obliquely narrowed subapically. Ventral processes of segment ten distinctive, long, apex divided into three lobes, each with an attached seta (Fig. 61).

Female. Unknown.

Length of anterior wing: male 4.1-4.5 mm.

Etymology. Named after the aboriginal word for the Clarence R. near the type locality - *wagengugurra*.

Distribution. NE-NSW, NE-Qld (Fig. 120).

Remarks. Only seven males have been recorded from three sites in two widely separated areas but the male can be identified by the distinctive shape of the processes on segment ten.

***Ecnomus karawalla* sp. nov.**

Figures 63, 64

Type material. Holotype male, Victoria, Wannon River, Nigretta Falls, 6 Dec 1983, A. Neboiss (NMV, T-10202, figured specimen CT-032).

Description. Male. Wings brownish-grey. Genitalia with superior appendage long, in lateral view with downwardly produced basiventral angle (Fig. 63). Inferior appendage in ventral view robust, length about 2× width, broadest in basal half, terminating in pointed apex (Fig. 64). In lateral view, paramere robust; phallus lacking subapical ventral swelling, with a broad process apically (Fig. 63).

Female. Unknown.

Length of anterior wing: male 6.0 mm.

Etymology. Named after the aboriginal word for the Wannon R. near the type locality – *karawalla*.

Distribution. W-Vic. (known from type locality only) (Fig. 120).

Remarks. Although this species is known from only one male specimen, which is grouped with *E. russellius* and *E. karakoi* sp. nov. on the basis of the similar shape of the superior appendages and the dorso-ventrally flattened inferior appendages. It differs from both sufficiently to warrant description as a distinct species.

***Ecnomus russellius* Neboiss**

Figures 65, 66, 83, 84

Ecnomus russellius Neboiss 1977: 56, figs 250–254. — Neboiss 1986: 150.

Type material. Holotype male, Tasmania, Russell Falls Nat. Pk, 20 Feb 1967, A. Neboiss (NMV, T-4854). Type seen.

Allotype female, collected with type (NMV, T-4855).

Paratypes. 4 males, 1 female, collected with holotype (NMV).

Other material examined. Tasmania. (localities additional to those published by Neboiss, 1977): 1 male (specimen CT-029 figured), Mersey R., Liena, 16 Nov 1972, A.N.; 1 female (specimen CT-108 figured), West Bay R., Margate, 6 Jan 1977, P. Allbrook, A.N.; 1 male, Great Musselroe R., Tebrakunna Rd, 7 Nov 1977, D. Coleman; 3 males, 3 females, Shannon R. at Wihareja, 29 Nov 1982, W. Fulton.

Victoria, numerous specimens from many streams, list of localities from author.

New South Wales. 5 males, McLauchlin R. nr Ando, 20 Nov 1965, A.N.; 3 males, 3 females, same loc., 4 Nov 1966, E.F. Riek (ANIC); 1 male, Dilgry R., 19 km NW Rawdon Vale, 31°53'S, 151°32'E, 18 Feb 1980,

A.A. Calder; 3 males, Styx R., 12 km S of Ebor, 17 Oct 1973, A.N.; 1 male, Ebor Falls, 12 Nov 1983, G. Theischinger; 1 male, Terania Ck, N of Lismore, 28°25'S, 153°18'E, 21 Jan 1986, G. Theischinger.

Queensland. Many males, Cunninghams Gap, various dates, G. Theischinger; 1 male, Goomburra State Forest, NE of Warwick, 28°03'S, 152°07'E, 20 Jan 1986, G. Theischinger; 1 male, South Pine R., 8 km W of Sanford, 21 Oct 1980, A.N.; 2 males, Saddle Tree Ck via Maidenwell, 29 Mar 1975, S.R. Monteith (ANIC); 8 males, 2 females, Mt Superbus, 22–24 Jan 1971, S.R. Monteith (ANIC).

Description (revised after Neboiss, 1977). Wings light brown to dark greyish-brown with paler irrorations.

Male. Genitalia with superior appendage long, in lateral view with strong downwardly produced basiventral angle extended into a point (Fig. 65). Inferior appendage in ventral view broad, length about 2× width, narrowed in distal half (Fig. 66). In lateral view, paramere dilated distally with apex curved downwards at right angles to form a distinct hook; phallus tapered distally, with a distinctive laterally compressed process apically (Fig. 65).

Female. Genitalia (Figs 83, 84): ventral plate lacking "pocket" but with strong ridge along mesal margin in distal 2/3, terminating in pointed inner apical angle.

Length of anterior wing: male 5.5–8.5 mm, female 8.0–9.0 mm.

Distribution. Tas., Vic., E-NSW, SE-Qld (Fig. 119).

Remarks. This common species shows some similarities to *E. karawalla* and *E. karakoi* sp. nov., especially in the shape of the inferior appendages, but can be distinguished by small differences.

***Ecnomus karakoi* sp. nov.**

Figures 67, 68

Type material. Holotype male, Victoria, Aire River, Otway Ranges, 6 Dec 1982, C. Yule (NMV, T-10203, figured specimen CT-030).

Description. Male. Wings greyish-brown. Genitalia with superior appendage long, in lateral view stout, with downwardly produced basiventral angle extended into a small projection (Fig. 67). Inferior appendage short, in ventral view robust, length about 2× width, with a subapical mesal projection at about distal third (Fig. 68). In lateral view, paramere with apex dilated and curved downwards to form a slight hook; phallus obliquely narrowed subapically, with a short process (Fig. 67).

Female. Unknown.

Length of anterior wing: male 7.2 mm.

Etymology. Named after the Karakoi aboriginal tribe, who inhabited the region including the type locality.

Distribution. SW-Vic. (Otway Ranges, known from type locality only) (Fig. 115).

Remarks. This is a large species known from only one male specimen, but it differs significantly in detail to warrant description as a distinct species. *E. karakoi* shows some similarities with *E. russellius*, *E. karawalla* and *E. nibbor* due to the similar shape of the superior appendages and the dorso-ventrally flattened inferior appendages, but differs in the detail of the inferior appendages.

Ecnomus tropicus sp. nov.

Figures 69, 70

Type material. Holotype male, Queensland, Upper Ross River below weir, SW of Townsville, 8 May 1979, A. Wells (NMV, T-10204).

Paratypes, 8 males (specimen CT-069 figured), collected with holotype (NMV).

Other material examined. Queensland, 1 male, Crystal Ck, Mt Spee turnoff, 2 May 1979, A.W.; 1 male, Alice R., Hervey Range Rd, 25 km W of Townsville, 9 May 1979, A.W.; 6 males, Laura, Cape York Peninsula, 7 Oct 1979, M.S. and B.J. Moulds; 1 male, swamp, 28 km N of Laura, 30 Nov 1974, Moulds; 1 male, Palmer R., 20 Jun 1971, E.F. Riek (ANIC); 7 males, Coen R., Coen, 31 Oct 1988, K. Walker.

Northern Territory, 2 males, Adelaide R., 15 km E of Stuart Hwy, 15 Aug 1979, J.B.; 1 male, South Alligator R., UDP Falls, 7 Sep 1979, J.B.; 1 male, ARRS South Alligator R. at Gimbat OSS Station, 24 May 1988, A.W., P.S.; 3 males, ARRS South Alligator R. above Fisher Ck jn, 24 May 1988, P.S., A.W.; 7 males, SAR site 1, various dates 1988, P. Dostine; 3 males, Jim Jim Ck on Kakadu Hwy, 28 May 1988, P.S., A.W.; 12 males, ARRS Kambolgie Ck, 25 May 1988, P.S., A.W.; 1 male, ARRS Radon Springs, 18–19 May 1988, P.S., A.W.; 1 male, ARRS Magela Ck, inlet to Mudginberri Billabong, 18 May 1988, P.S., A.W.; 4 males, Magela Ck at Ranger pipe outlet, 23 May 1988, P.S., A.W.; 1 male, Coonjimba Billabong, 19 May 1988, P.S., A.W.; 1 male, ARRS East Alligator R. at Cahills Crossing, 27 May 1988, A.W., P.S.

Western Australia, 1 male, Granite Ck, Kununurra Hwy, L Argyle, 2 Feb 1978, J.E.B.; 1 male, Spillway Ck, 2 Feb 1978, J.E.B.; 5 males, Morgan R., Theda H.S., Kimberleys, 28 Sep 1979, J.B.; 1 male, Drysdale R. headwaters, 30 km NW Mt Elizabeth H.S., 30 Sep 1979, J.B.; 1 male, Drysdale R., 14°39'S, 126°57'E, 18–21 Aug 1975, I. Common, M.S. Upton (ANIC); 1 male, Adcock Gorge, Gibb R.—Derby Rd, Kimberleys, 2 Oct 1979, J.B.; 1 male, Mitchell Plateau, crusher, 4 km SW

mining camp, 14°52'S, 125°50'E, 2–6 Jun 1988, I.D. Naumann (ANIC).

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view broadest in basal half, tapered distally (Fig. 69). Inferior appendage in ventral view, almost parallel sided, length about 4× width, apex weakly bifid (Fig. 70), especially from ventro-lateral view (Fig. 69). In lateral view, paramere slender; phallus obliquely narrowed subapically (Fig. 69).

Female. Unknown.

Length of anterior wing: male 4.0–4.4 mm.

Etymology. *Tropicus* (Latin) tropic loving (northern distribution).

Distribution. NE-Qld, N-NT, N-WA (Kimberley region) (Fig. 120).

Remarks. The male is identified by the bifid apices on inferior appendages.

Ecnomus apiculatus sp. nov.

Figures 71, 72

Type material. Holotype male, Western Australia, Ord River, 9 km N Kununurra, 19 Sep 1979, J. Blyth (NMV, T-10213).

Paratypes, 6 males (specimen CT-018 figured), collected with holotype (NMV).

Other material examined. Western Australia, 3 males, Gieki Gorge Nat. Pk, 9 Oct 1979, J.B.; 1 male, Dunham R., W Kununurra, 22 Feb 1977, J.E.B.; 4 males, Spillway Ck, Ord R. Dam, 20 Feb 1977, J.E.B.; 3 males, same loc., 2 Feb 1978, J.E.B.; 14 males, Ord R. below dam, various dates, J.E.B.; 1 male, Fine Springs Ck, 2 Feb 1978, J.E.B.; 1 male, Stonewall Ck, 4 Feb 1978, J.E.B.; 8 males, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 5 males, stream opposite Deadhorse Gap, L Argyle, 19 Feb 1977, J.E.B.; 2 males, Granite Ck, Kununurra-L Argyle Hwy, 2 Feb 1978, J.E.B.; 6 males, 15 km S of Winjana Gorge, 4 Aug 1989, McCubbin.

Northern Territory, 12 males, 12 km NNE of Borrooloola, 15°58'S, 136°21'E, 1 Nov 1975, J.C. Cardale (ANIC); 1 male, Batten Point, 15°54'S, 136°32'E, 30 km NE of Borrooloola, 30 Oct 1975, J.C. Cardale (ANIC).

Queensland, 6 males (specimen CT-039 partly figured), Brisbane R. nr Kholo, 9 Mar 1973, M.H. Colbo.

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view broad-based, tapered gradually distally (Fig. 71). Inferior appendage in ventral view, length about 3× width, with a dorso-mesally directed digitiform process apically (Fig. 72), in lateral view, length about 3× width; paramere long, slender; phallus lacking ventral subapical swelling (Fig. 71).

Female. Unknown.

Length of anterior wing: male 3.0–4.3 mm.

Etymology. *Apiculatus* (Latin) small pointed (inferior appendages.)

Distribution. N-WA (Kimberley region), N-NT, SE-Qld (Fig. 117).

Remarks. This is a variable species. One specimen from N-Western Australia (Fig. 71a) and six from SE-Queensland (Fig. 71b) differ from the type specimens by having inferior appendages broader in lateral view. The pointed inferior appendages resemble those of *E. cuspidis* and *E. bishopi*, but these species differ in the shape of the parameres.

***Enomus kinka* sp. nov.**

Figures 73, 74

Type material. Holotype male, Western Australia, Morgan River, Theda H.S., Kimberleys, 28 Sep 1979, J. Blyth (NMV, T-10220).

Paratypes, 6 males (specimen CT-061 figured), collected with holotype (NMV).

Other material examined. Western Australia, 4 males, Granite Ck, Kununurra–L. Argyle Hwy, 2 Feb 1978, J.E.B.

Northern Territory, 1 male, Jasper Ck, Victoria R. Downs Rd, 45 km SSE Timber Ck, 17 Sep 1979, J.B.; 2 males, Katherine R. Gorge Nat. Pk, 13 Aug 1979, J.B.; 7 males, Adelaide R., 15 km E of Stuart Hwy, 15 Aug 1979, J.B.; 33 males, South Alligator R., various sites, various dates 1988–1989, A.W., P.S.; 3 males, South Alligator R. at Gimbat OSS Station, 28 Apr 1988, P. Dostine; 16 males, SAR site 1, various dates 1988, P. Dostine; 88 males, Kambolgie Ck, 25–26 May 1988, A.W., P.S.; 1 male, Graveside Ck, 18 Jul 1988, P. Dostine; 6 males, Ck 5 km W of OSS Gimbat Field Station, 19 Apr 1989, A.W., P.S.; 6 males, Magela Ck, various sites and dates 1988, A.W., P.S.; 10 males, Magela Ck, S of Georgetown Billabong, 6 Nov 1982, A.J. Sharley (NTM); 2 males, ARRS Stag Ck at BHP camp, 25 May 1988, P.S., A.W.; 3 males, Gulungul Ck, inlet to Gulungul Billabong, 17 May 1988, A.W., P.S.; 1 male, same loc., 20 Apr 1989, A.W., P.S.; 1 male, Nourlangie Ck, 6 km E of Mt Cahill, 12°52'S, 132°46'E, 18 Nov 1972, J.C. Cardale (ANIC); 1 male, Cattle Ck, 54 km SW of Borroloola, 16°32'S, 136°10'E, 27 Oct 1975, J.C. Cardale (ANIC); 1 male, 14 km NW of Cape Crawford, 16°34'S, 135°41'E, 6 Nov 1975, J.C. Cardale (ANIC).

Queensland, 1 male, McLeod R., 15 km W of Mt Carbine, 22–23 Jun 1975, S.R. Monteith (ANIC); 2 males, 16 km S of Coen, 29 Nov 1974, M.S. Moulds; 1 male, Laura, Cape York Peninsula, 7 Oct 1979, M.S. and B.J. Moulds; 1 male, Alice R., Hervey Range Rd, 25 km W Townsville, 9 May 1979, A.W.

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view, broad-

est in basal half, tapered distally (Fig. 73). Inferior appendage in ventral view, length about 4× width, parallel sided, inner margin inflected towards middle of apical projection subapically (Fig. 74), as in *E. pilbarensis* sp. nov. In lateral view, paramere long and slender; phallus obliquely narrowed subapically (Fig. 73).

Female. Unknown.

Length of anterior wing: male 3.3–4.5 mm.

Etymology. Named after a Western Australian aboriginal word for many hills – *kinka* (type locality – Kimberley region).

Distribution. N-WA (Kimberley region), N-NT, NE-Qld (Fig. 117).

Remarks. The form of the inferior appendage is similar to *E. pilbarensis* sp. nov. but the species differ in other details.

***Enomus pilbarensis* sp. nov.**

Figures 75, 76

Type material. Holotype male, Western Australia, Wittencoom Gorge, 10 km E of Roebourne Rd, Pilbara, 24 Oct 1979, J. Blyth (NMV, T-10227).

Paratypes, 5 males (specimen CT-022 figured), collected with holotype (NMV).

Other material examined. Western Australia, 3 males, Wooramel R., Gasgoyne Jn–Mullewa Rd, 11 Nov 1979, J.B.; 7 males, Wittencoom Gorge, Hamersley Range, 20 Feb 1977, M.S. and B.J. Moulds; 1 male, Fortescue Falls, Hamersley Range Nat. Pk, 27 Oct 1979, J.B.; 1 male, 15 km E of Millstream, 20 Oct 1970, J.C. Cardale (ANIC); 2 males, Crossing Pool, Millstream, 21 Oct 1970, J.C. Cardale (ANIC); 2 males, same loc., 21–22 Apr 1972, N.R. Mitchell (ANIC); 1 male, same loc., 21 Oct 1979, J.B.; 1 male, Millstream H.S., 21°35'S, 117°04'E, 2 Apr 1971, E.F. Riek (ANIC); 1 male, N of Carnarvon, De Grey Station Rd, 29 Apr 1972, N. McFarland; 7 males, Kimberley, 6.5 km NW Mt Bell, 17°10'S, 125°17'E, 25–26 Jul 1988, T.F. Houston (WAM); 1 male, Granite Ck, Kununurra–L. Argyle Hwy, 2 Feb 1978, J.E.B.

Northern Territory, 2 males, Newcastle Waters, 10 km W of Elliot, 10 Aug 1979, J.B.; 1 male, 14 km NW of Cape Crawford, 16°34'S, 135°41'E, 6 Nov 1975, J.C. Cardale (ANIC).

Queensland, 1 male, Stoney Ck on Mt Stuart Rd, Stuart, Townsville, 27 Apr 1979, A.W.; 2 males, Upper Ross R. below weir SW of Townsville, 8 May 1979, A.W.

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view, length about 2× width, broadest in basal half, tapered distally (Fig. 75). Inferior appendage in ventral view length about 2.5× width, narrowed in median section, inner margin inflected towards middle of apical projection subapically (Fig. 76).

as in *E. kinka*. In lateral view, paramere straight with slightly spatulate apex; phallus obliquely narrowed subapically, extended into a short process apically (Fig. 75).

Female. Unknown.

Length of anterior wing: male 4.4–4.8 mm.

Etymology. Named after the Pilbara region (type locality).

Distribution. N-WA, N-NT, NE-Qld (Fig. 118).

Remarks. *E. pilbarensis* is a widespread northern Australian species, similar to *E. kinka* in the form of the inferior appendage.

Ecnomus larakia sp. nov.

Figures 77, 78

Type material. Holotype male, Northern Territory, Howard Springs, 9 Sep 1980, D. King (NMV, T-10233).

Paratypes, 11 males (specimen CT-072 figured), collected with holotype (NMV).

Other material examined. Western Australia, 1 male, Drysdale R. at Kalumburu Rd crossing, Kimberleys, 28 Sep 1979, J.B.

Northern Territory, 9 males, Lambell's Lagoon, Humpty Doo, 19 Aug 1979, J.B.; 4 males, Jim Jim Ck on Kakadu Hwy, 28 May 1988, P.S., A.W.; 7 males, Goanna Lagoon, 1 km W of Jabiru off Arnhem Hwy, 27 Jun 1979–27 Mar 1980, R. Marchant; 5 males, Georgetown Billabong nr Jabiru, 27 Jun 1983–25 Jul 1983, A.J. Sharley (NTM); 2 males, Corndorl Billabong nr Jabiru, 6–8 Nov 1982, A.J. Sharley (NTM); 1 male, ARRS Coonjimba Billabong, 19 May 1988, P.S., A.W.; 19 males, ARRS Gulungul Ck, inlet to Gulungul Billabong, 17 May 1988, P.S., A.W.; 6 males, same loc., 20 Apr 1989, A.W., P.S.; 19 males, same loc., 11 Apr 1989, P.S., A.W.; 1 male, ARRS Magela Ck at Ranger pipe outlet, 20 May 1988, A.W., P.S.; 11 males, Nourlangie Ck, 8 km N of Mt Cahill, 12°48'S, 132°42'E, 16–17 Jun 1973, J.C. Cardale (ANIC); 1 male, 12 km NNW of Mt Cahill, 12°46'S, 132°39'E, 15–16 Jun 1973, J.C. Cardale (ANIC); 8 males, Nourlangie Camp Lagoon, Kakadu Nat. Pk, 4 Sep 1979, J.B.

Queensland, 1 male, swamp, 28 km N of Laura, 30 Nov 1974, Moulds; 1 male, Ross R. at Apex Pk nr Townsville, 26 Apr 1979, A.W.

Description. Male. Wings pale fawn. Genitalia with superior appendage short, in lateral view broadbased, tapered strongly distally (Fig. 77). Inferior appendage in ventral view, length about 3× width, slightly constricted medially, dilated subapically, tapered to a pointed apex (Fig. 78). In lateral view, paramere short and robust; phallus obliquely narrowed subapically (Fig. 77).

Female. Unknown.

Length of anterior wing: male 2.9–3.5 mm.

Etymology. Named after the Larakia aboriginal tribe, who inhabited the region including the type locality.

Distribution. N-WA (Kimberley region), N-NT, NE-Qld (Fig. 112).

Remarks. A small species, distinguished from others by small differences in the inferior appendages. The shape of the superior and inferior appendages are very similar to *E. kitabal*, which differs in possessing a process on segment nine.

Ecnomus pakadji sp. nov.

Figures 79, 80

Type material. Holotype male, Queensland, Iron Range, West Claudie River, 17 Sep 1974, M.S. Moulds (NMV, T-10245, figured specimen CT-052).

Description. Male. Wings pale fawn. Genitalia with superior appendage long, in lateral view length about 3× width (Fig. 79). Inferior appendage long, in ventral view length about 3× width, slightly inflected and tapered slightly distally, with a small process apically (Fig. 80). In lateral view, paramere robust with apex slightly dilated; phallus lacking ventral subapical swelling (Fig. 79).

Female. Unknown.

Length of anterior wing: male 4.0 mm.

Etymology. Named after the Pakadji aboriginal tribe who inhabited the region including the type locality.

Distribution. NE-Qld (known from type locality only) (Fig. 112).

Remarks. Only one male specimen is known for this species. It differs sufficiently from all other species in genitalic characters to warrant being placed in a separate species.

Ecnomus walajandari sp. nov.

Figures 81, 82

Type material. Holotype male, Western Australia, Spillway Ck, Ord River Dam, 2 Feb 1978, J.E. Bishop (NMV, T-10246).

Paratypes, 11 males (specimen CT-065 figured), collected with holotype (NMV).

Other material examined. Western Australia, 1 male, Spillway Ck, Ord R. Dam, 20 Feb 1978, J.E.B.; 2 males, Ord R. at Kununurra Dam, 22 Feb 1977, J.E.B.; 8 males, Deadhorse Springs, L Argyle, 19 Feb 1977, J.E.B.; 9 males, stream opposite Deadhorse Gap, L

Argyle, 19 Feb 1977, J.E.B.; 2 males, Mitchell Plateau, Camp Ck at crusher, 18 Feb 1979, J.E.B.; 1 male, Charnley R., 16°22'S, 125°12'E, 2 km SW Rolly Hill, 16–20 Jun 1988, I.D. Naumann (ANIC).

Northern Territory. 1 male, Katherine R. Gorge Nat. Pk, 26 Jan 1977, M.S. and B.J. Moulds; 1 male, same loc., 13 Aug 1979, J.B.; 1 male, ARRS Kambolgie Ck, 25 May 1988, P.S., A.W., 1 male, SAR Rock Hole Ck, November 1988, P. Dostine; 1 male, South Alligator R. nr Koolpin Crossing, 14 Oct 1987, P. Dostine; 1 male, ARRS South Alligator R. above Fisher Ck jn, 24 May 1988, A.W., P.S.; 1 male, ARRS South Alligator R. below Fisher Ck jn, 24 May 1988, A.W., P.S.; 3 males, ARRS South Alligator R. above BHP camp, 25 May 1988, A.W., P.S.; 9 males, ARRS South Alligator R. at Gimbat OSS Station, 28 May 1988, P. Dostine; 3 males, SAR, site 1, 14 Jun 1988, P. Dostine; 3 males, same loc., October 1988, P. Dostine; 2 males, ARRS Graveside Gorge, 18 Jul 1988, P. Dostine; 1 male, Bowerbird Billabong outlet, 1 Oct 1988, P. Dostine.

Description. Male. Wings pale fawn. Genitalia with superior appendage in lateral view broadest in basal half, tapered gradually distally (Fig. 81). Inferior appendage in ventral view, very similar to *E. wagengugurra* but more robust, length about 2x width, inner margin inflected towards base of apical point (Fig. 82). In lateral view, paramere moderately slender; phallus lacking ventral subapical swelling (Fig. 81).

Female. Unknown.

Length of anterior wing: male 2.9–3.7 mm.

Etymology. Named after the Walajandari aboriginal tribe who inhabited the region including the type locality.

Distribution. N-WA (Kimberley region), N-NT (Fig. 120).

Remarks. A small species, resembling *E. wagengugurra* in the form of the inferior appendages, but differs in other characters, especially the shape of the processes on the tenth segment.

Discussion

Neboiss (1981) has recognized three major Australian faunal provinces based on climatic zones, with associated distributional barriers and refuge areas. Although species of *Ecnomus* are distributed over most of the continent, species richness is greatest in wet-tropical and eastern Australia. Numbers of species in each province and region are shown in Fig. 109. Twenty-seven species are known from the Torresian province, 21 from the Bassian and seven from the drier Eyrean province. The fauna is particularly rich in parts of the Torresian pro-

vince with 19 species in the Kimberley region of north-western Australia, 22 species in the northern half of the Northern Territory and 16 species in NE-Queensland. Of the 27 species found in the Torresian province, eight are restricted to the Kimberley and Northern Territory regions and two are endemic to NE-Queensland. The remainder are widely distributed across northern Australia including six northern species which extend their ranges into the NE-Bassian province, several as far south as the Clarence River in NE-New South Wales. Within the Eyrean province, three species occur in the Pilbara region of Western Australia while four species occur in the eastern half. In the Pilbara *E. ingibandi* is endemic, while the other two species occur widely throughout the Torresian province. In the eastern half of the province, *E. centralis* is mostly restricted to that region, while *E. continentalis*, *E. pansus* and *E. turgidus* are also widely distributed in the Bassian and limited areas of the Torresian provinces. Most species in the Bassian province have been recorded from SE-Queensland, NE-New South Wales and Victoria. Only three species are recorded from Tasmania and two from SW-Australia, with none of the species being endemic.

The distribution of species of *Ecnomus* provides support for the following faunal barriers or disjunctions recognized by Campbell (1981), Keast (1981), Neboiss (1981) and Watson and Theischinger (1984) (Fig. 109):

1. Between Townsville and Eungella Range, east coast barrier for 13 out of 15 "southern" species (exceptions *E. continentalis* and *E. well-sae*), and 17 out of 23 "northern" species. The NE-Bassian region between disjunction 1 and the Clarence River, NE-NSW, appears to be an overlap zone for many Torresian and Bassian species, with six "northern" and nine "southern" species reaching their southern and northern range limits, respectively within the zone.

2. Bass Strait, southern barrier for 12 out of 15 Bassian species.

3. Nullabor Plain, western barrier for all but two eastern Bassian species. The exceptions are *E. pansus* and *E. turgidus*.

4. Semi-desert, north of Geraldton, Western Australia, west coast disjunction for "northern" (Torresian and Pilbara region) and Bassian species.

5. Great Sandy Desert in northern Western Australia, southern barrier on west coast for 17 out of 19 species from the Kimberley region and northern barrier for *E. ingibandi*, endemic to the

Pilbara region, and is closely related to two species found in the Kimberley region.

6. Steppe areas south of the Gulf of Carpentaria, a weaker disjunction restricting eight out of 22 western Torresian species and five out of 16 eastern Torresian species, although 13 of the 27 species found in the Torresian region do occur in both areas.

The Australian fauna is almost as rich as that of Africa. *Ecnomus* is also well represented in the Pakistan-India-Sri Lanka region, with 15 described species (Fischer, 1960-1973) and Papua-New Guinea with about 19 species (including 17 undescribed species, pers. obs.). The concentration of approximately three-quarters of the known *Ecnomus* fauna in the African and Australian regions, and the Indian subcontinent suggests a Gondwanan origin, however, *Ecnomus* has not been recorded from South America or New Zealand. Therefore valid arguments could be made for an Oriental origin with dispersal and subsequent speciation in Africa and Australia.

Males of Australian species of *Ecnomus* are characterized by a pair of superior appendages which range from long and slender to short and broadbased; a pair of inferior appendages which vary from long and slender to short and broad with several processes; a pair of parameres which are mostly shorter than the phallus, with apices usually either tapered and straight or curved downwards to form a hook. *E. veratus* is an exception as it has a single, highly modified paramere, which is elongated and downcurved. The shape of the phallus is conservative, usually narrowing subapically, with or without a prominent ventral swelling and spines. All species have a pair of short, simple processes located on segment ten.

In this study, 12 *Ecnomus* females from southern Australia are described. Ten of these species have a "pocket" on each of the ventral plates. The position and shape of these "pockets" is diagnostic, and seems to correspond with the position and shape of the mesal projections on the inferior appendages of the males, which form a "key in lock" pairing during copulation. "Pockets" have not been described before in *Ecnomus* females and perhaps this group of southern Australian species forms a distinct phylogenetic group. The widespread distribution of species in Australia and the diversity of male genitalic structures, however, suggests that Australian species may not all be monophyletic in origin.

Very little has been discussed regarding the phylogeny of the genus *Ecnomus*. Kimmins (1957), Scott (1968) and Barnard and Clark (1986) have all detailed characteristics which distinguish the *natalensis*-group of species from Africa. This group of about 23 species (Barnard and Clark 1986), is recognized by males with inferior appendages having a dorsal finger-like extension and a spur formula 2.4.4, as opposed to the usual 3.4.4. Barnard and Clark (1986) also distinguished a subgroup within the *natalensis*-group of about ten species which have the apex of the phallus divided into a pair of flattened plates and parameres with a pre-apical tooth. Barnard and Clark (1986) suggested that the *natalensis*-group is monophyletic, due to the particular form of the male genitalia, although no other species groups have yet been recognized within the genus. Males of Australian species also differ from the type species, *E. tenellus*, which is characterized by a phallus with a sub-apical process and no parameres (Schmid, 1961).

Many of the northern Australian species have superior appendages which are broadbased and short, which is a characteristic shared with many African species (Kimmins, 1957; Scott, 1963). However most southern and eastern Australian species have superior appendages which are long and relatively uniform in width, a characteristic shared with many described Oriental species (Mosely, 1932; Schmid, 1958; Ulmer, 1951) and undescribed species from Sulawesi and Papua-New Guinea (pers. obs.).

When the *Ecnomus* fauna is more completely known, there will be scope for a detailed phylogenetic and zoogeographic study of the genus.

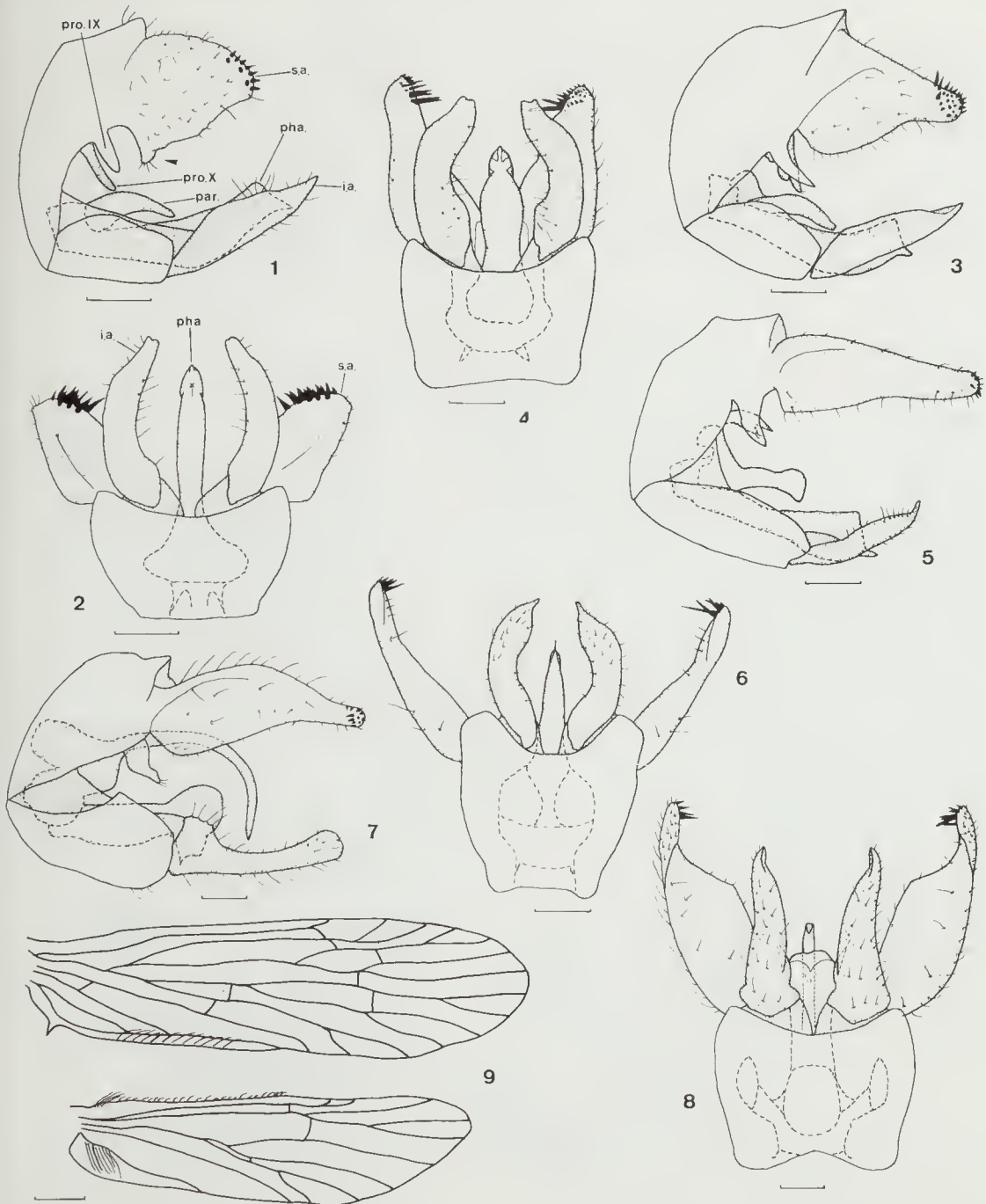
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Figures 1-9. *Ecnomus* spp. Males.

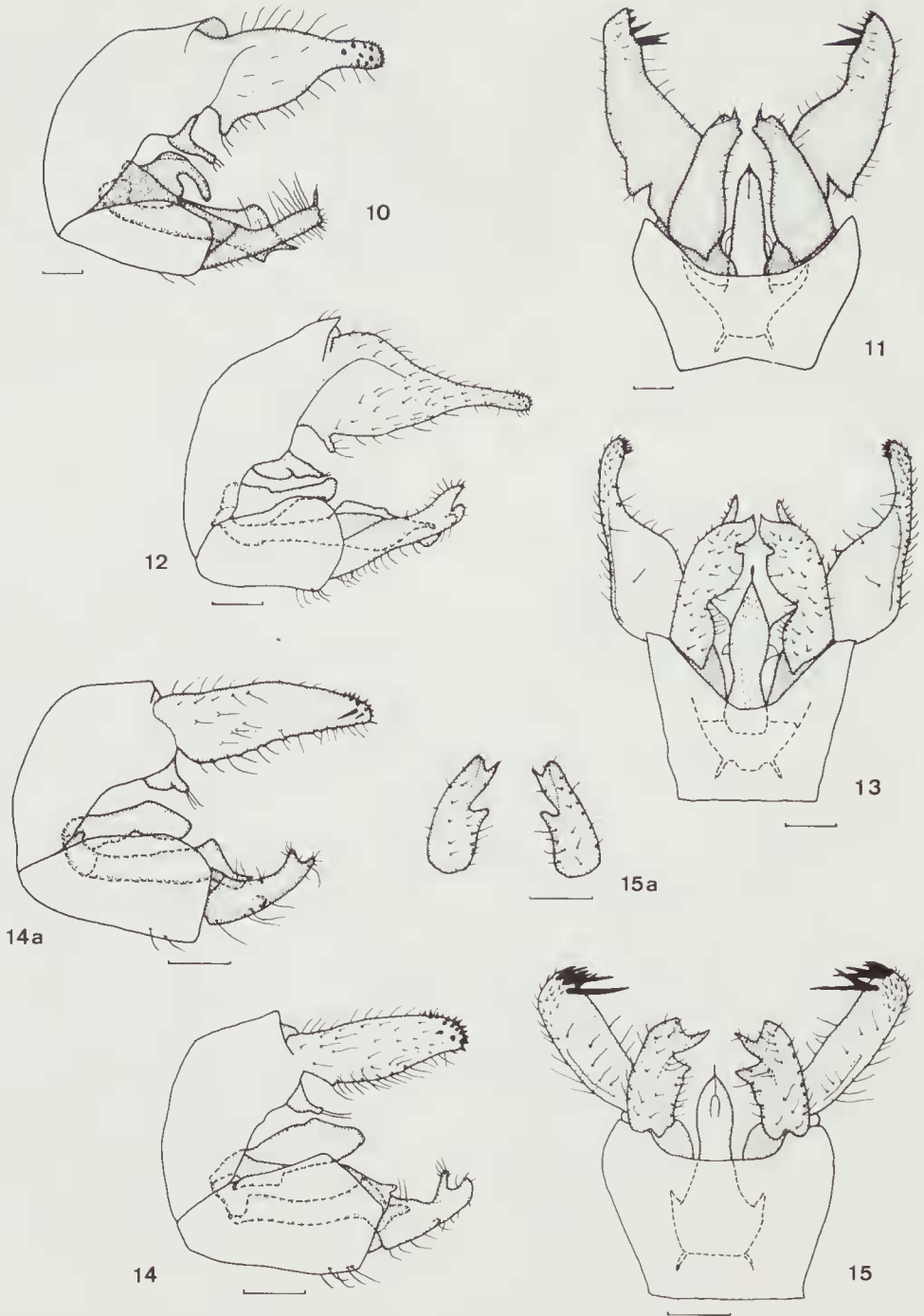
1, 2. *Ecnomus ingibandi* sp. nov., paratype, N-WA. (CT-053); genitalia: 1, lateral view; 2, ventral view; i.a., inferior appendage; par., paramere; pha., phallus; pro. IX, process on ninth abdominal segment; pro. X, process on tenth abdominal segment; s.a., superior appendage.

3, 4. *Ecnomus kitabal* sp. nov., paratype, NE-NSW. (CT-044); genitalia: 3, lateral view; 4, ventral view.

5, 6. *Ecnomus jimba* sp. nov., paratype, N-WA. (CT-046); genitalia: 5, lateral view; 6, ventral view.

7-9. *Ecnomus veratus* sp. nov., paratype, N-NT. (CT-056); 7, genitalia, lateral view; 8, genitalia, ventral view; 9, wing venation.

Scale lines: figs 1-8, 0.1 mm; fig. 9, 0.5mm.



Figures 10–15. *Ecnomus* spp. Male genitalia.

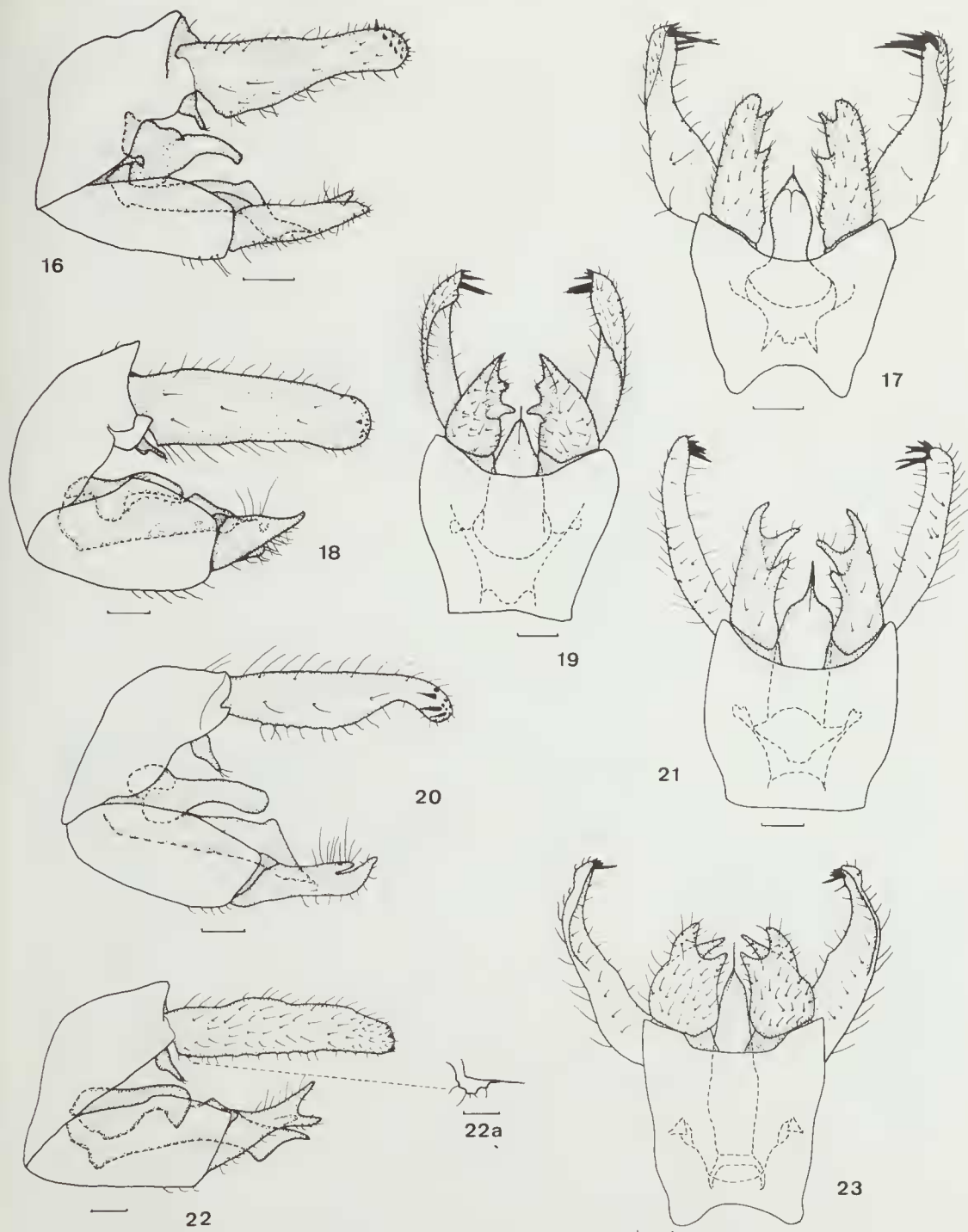
10, 11. *Ecnomus turgidus* Neboiss, paratype, S-WA. (CT-026): 10, lateral view; 11, ventral view.

12, 13. *Ecnomus digrutus* sp. nov., paratype, N-WA. (CT-067): 12, lateral view; 13, ventral view.

14, 15. *Ecnomus woronan* sp. nov., paratype, N-WA. (CT-078): 14, lateral view; 15, ventral view.

14a, 15a. *Ecnomus woronan* sp. nov. (variety), NE-Qld. (CT-063): 14a, lateral view; 15a, inferior appendage, ventral view.

Scale lines: all 0.1 mm.



Figures 16–23. *Ecnomus* spp. Male genitalia.

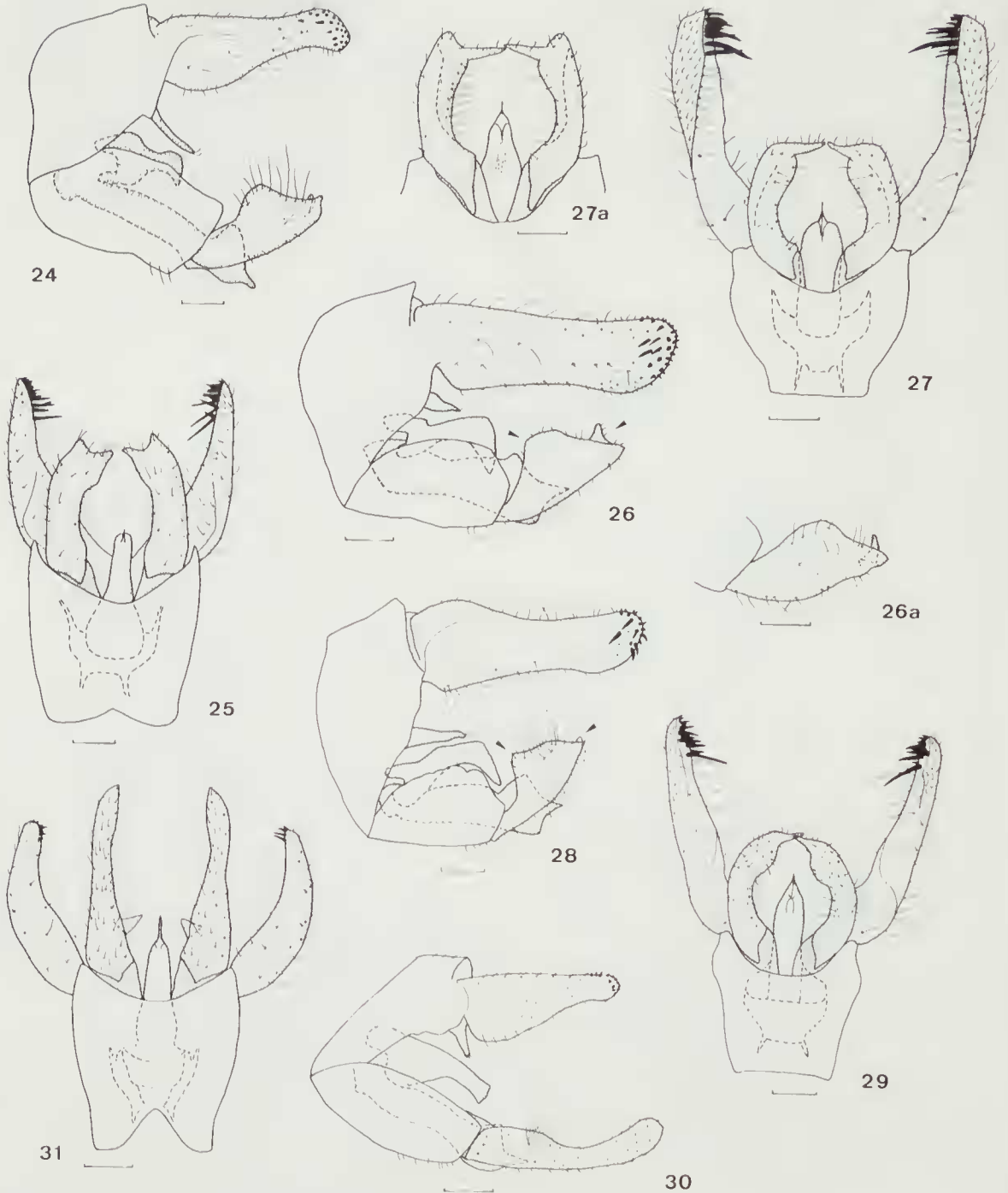
16, 17. *Ecnomus kakaduensis* sp. nov., paratype, N-NT. (CT-066): 16, lateral view; 17, ventral view.

18, 19. *Ecnomus wellsae* sp. nov., paratype, NE-NSW. (CT-017): 18, lateral view; 19, ventral view.

20, 21. *Ecnomus tridigitus* sp. nov., paratype, NE-NSW. (CT-012): 20, lateral view; 21, ventral view.

22, 23. *Ecnomus nevoissi* sp. nov., holotype, E-Vie. (CT-031): 22, lateral view; 22a, superior appendage, basiventral angle, ventro-lateral view; 23, ventral view.

Scale lines: all 0.1 mm.



Figures 24–31. *Ecnomus* spp. Male genitalia.

24, 25. *Ecnomus turbal* sp. nov., paratype, SE-Qld. (CT-041): 24, lateral view; 25, ventral view.

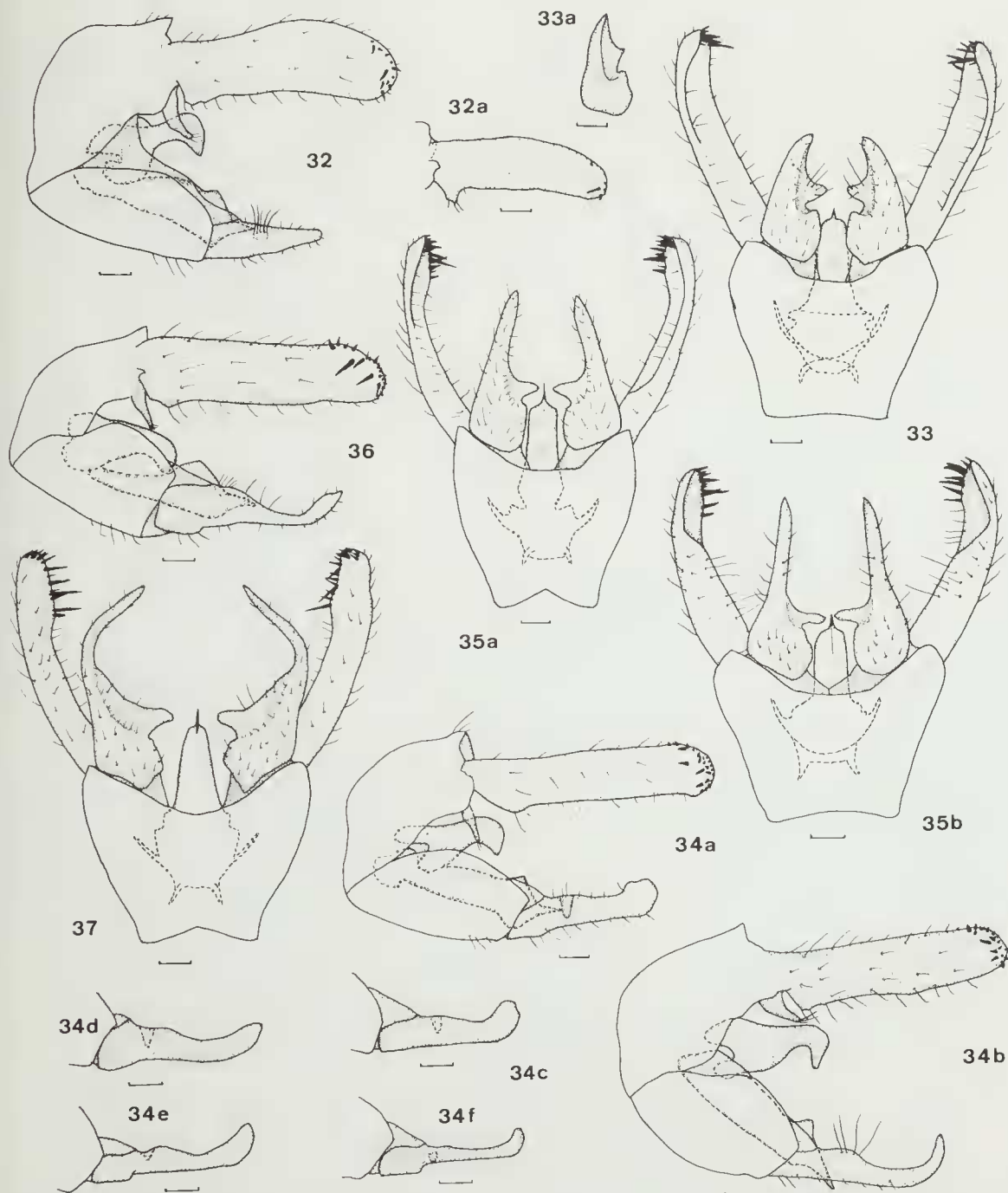
26, 27. *Ecnomus cuspidis* sp. nov., paratype, NE-Qld. (CT-073): 26, lateral view; 27, ventral view.

26a, 27a. *Ecnomus cuspidis* sp. nov. (variety), SE-Qld. (CT-074), inferior appendages: 26a, lateral view; 27a, ventral view.

28, 29. *Ecnomus bishopi* sp. nov., paratype, N-WA. (CT-079): 28, lateral view; 29, ventral view.

30, 31. *Ecnomus clavatus* sp. nov., paratype, N-NT. (CT-043): 30, lateral view; 31, ventral view.

Scale lines: all 0.1 mm.



Figures 32–37. *Ecnomus* spp. Male genitalia.

32, 33. *Ecnomus deani* sp. nov. paratype, Vic. (CT-013): 32, lateral view; 33, ventral view.

32a, 33a. *Ecnomus deani* sp. nov. (variety), Vic. (CT-036): 32a, superior appendage, lateral view; 33a, inferior appendage, ventral view.

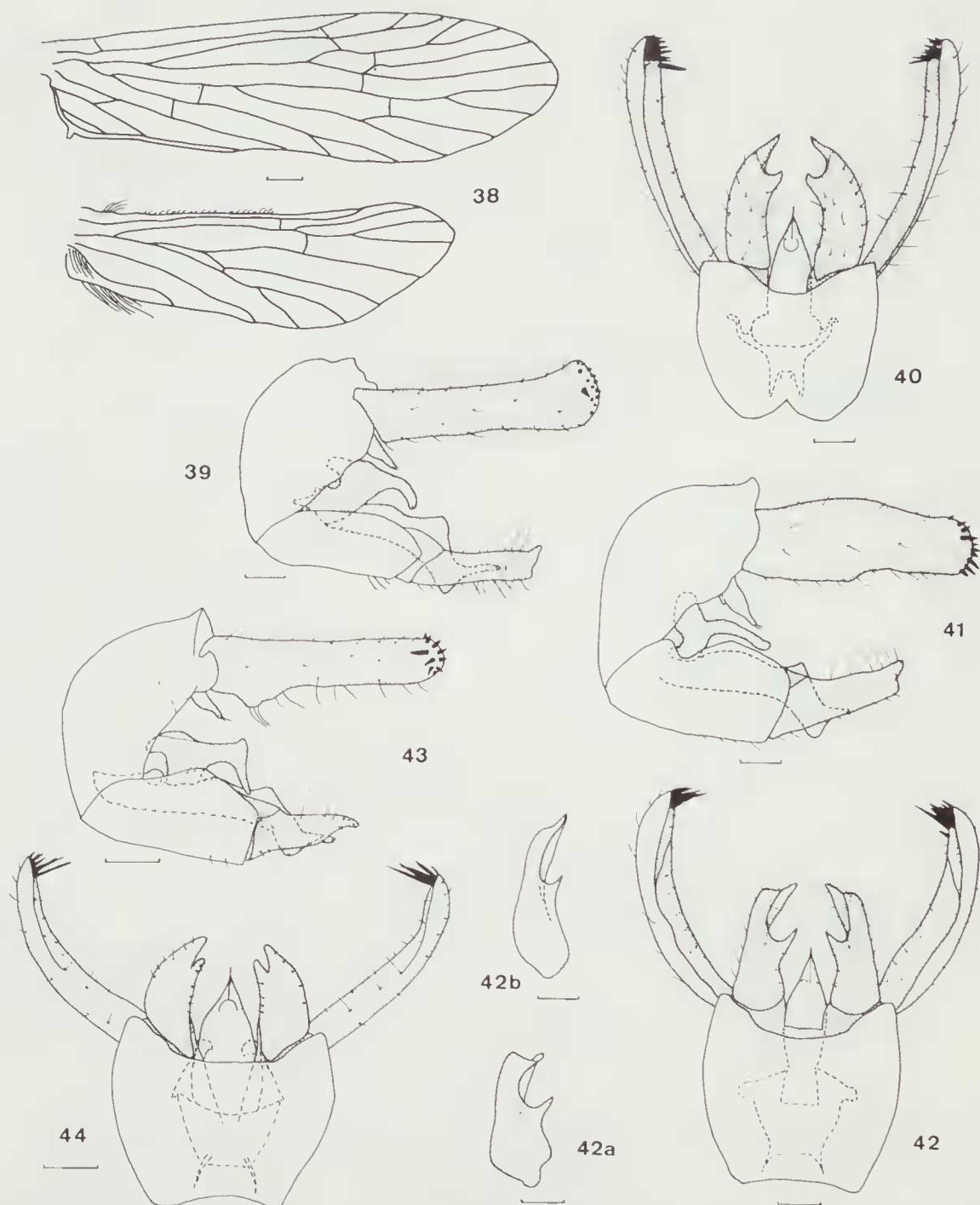
34a, 35a. *Ecnomus tillyardi* Mosely, Tas. (CT-024): 34a, lateral view; 35a, ventral view.

34b, 35b. *Ecnomus tillyardi* Mosely (variety), E-Vic. (CT-011) 34b, lateral view; 35b, ventral view.

34c–f. *Ecnomus tillyardi* Mosely (varieties), inferior appendage, lateral: 34c, nr Naracoorte, SE-SA. (CT-033); 34d, L Purrumbete, Vic. (CT-035); 34e, SW Kyneton, Vic. (CT-034); 34f, SW Healesville, Vic. (CT-050).

36, 37. *Ecnomus volsellus* sp. nov., paratype, Vic. (CT-014): 36, lateral view; 37, ventral view.

Scale lines: all 0.1 mm.



Figures 38–44. *Ecnomus* spp. Males.

38, *Ecnomus volsellus* sp. nov., paratype, Vic. (CT-014): wing venation.

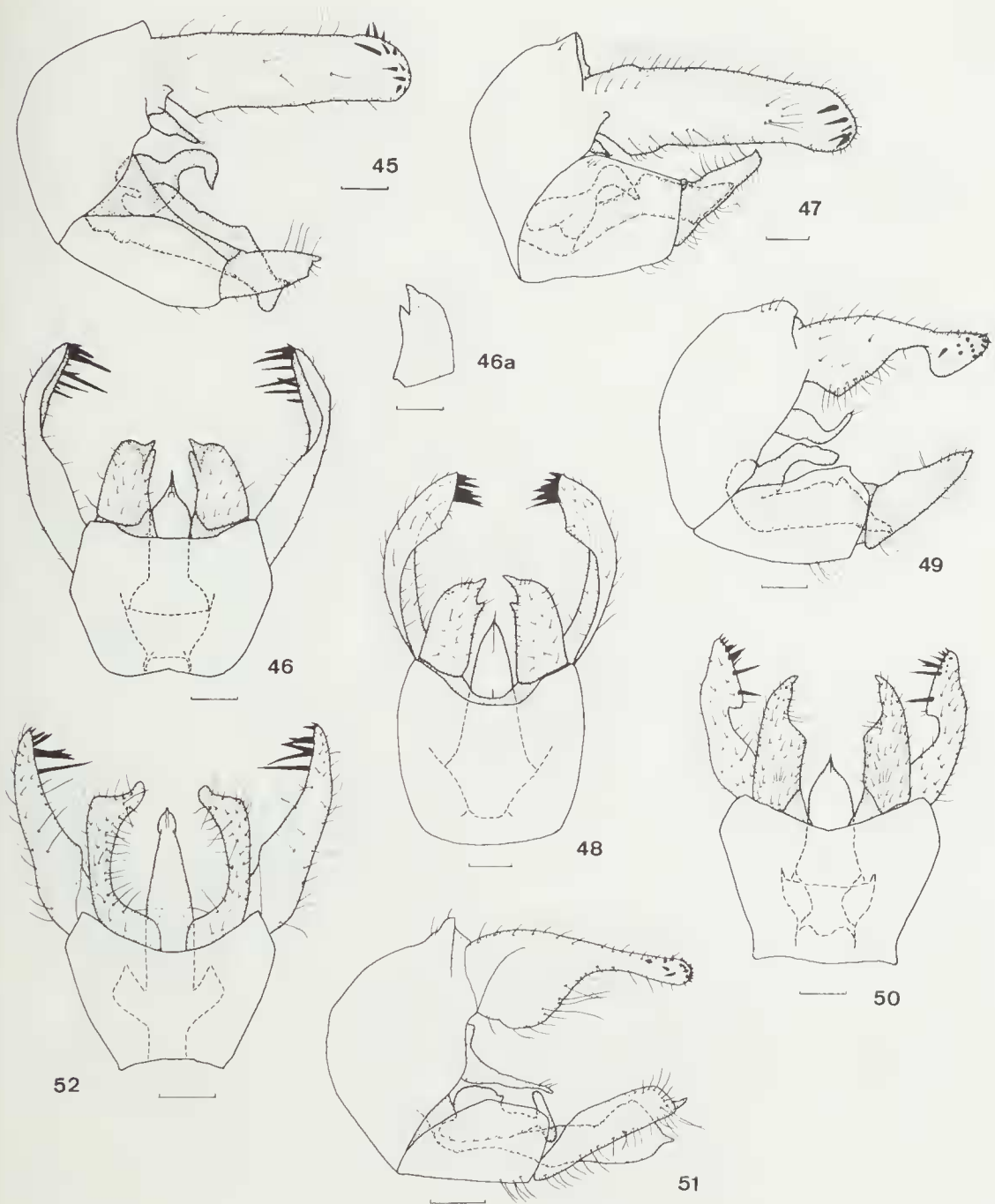
39, 40. *Ecnomus pansus* Neboiss, paratype, S-WA. (CT-027), genitalia: 39, lateral view; 40, ventral view.

41, 42. *Ecnomus cygnitus* Neboiss, Vic. (CT-025), genitalia: 41, lateral view; 42, ventral view.

42a, 42b. *Ecnomus cygnitus* Neboiss (varieties), inferior appendage, ventral: 42a, SE-Qld. (PT-557); 42b, Tas. (PT-458).

43, 44. *Ecnomus kerema* sp. nov., holotype, NE-Qld. (CT-103), genitalia: 43, lateral view; 44, ventral view.

Scale lines: fig. 38, 0.5 mm; figs 39–44, 0.1 mm.



Figures 45–52. *Ecnomus* spp. Male genitalia.

45, 46. *Ecnomus continentalis* Ulmer, NE-Qld. (CT-028): 45, lateral view; 46, ventral view.

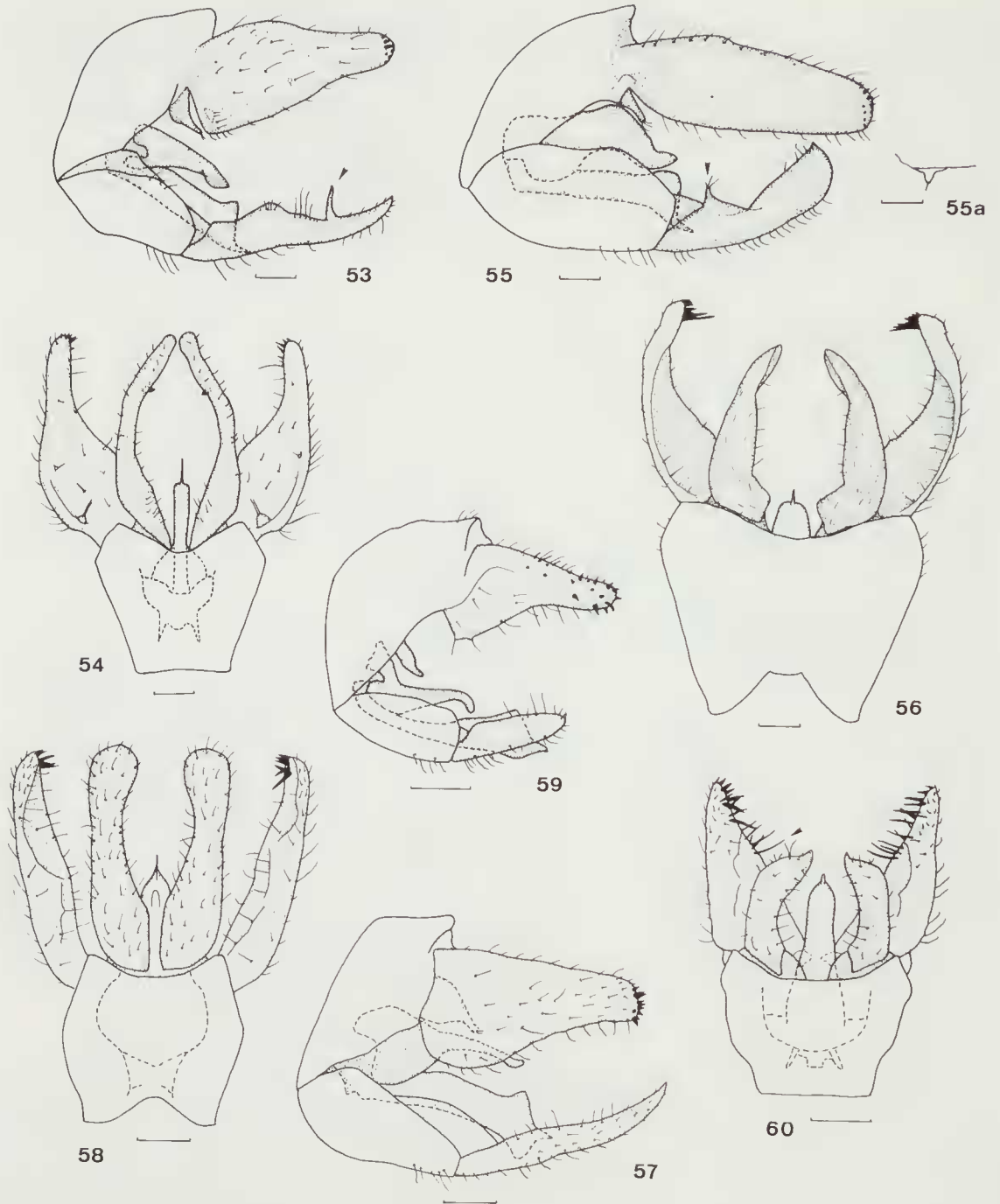
46a, inferior appendage, apico-ventral view.

47, 48. *Ecnomus nibbor* sp. nov., paratype, Vic. (CT-016): 47, lateral view; 48, ventral view.

49–50. *Ecnomus ancisus* sp. nov., paratype, N-WA. (CT-051): 49, lateral view; 50, ventral view.

51, 52. *Ecnomus blythi* sp. nov., paratype, N-NT. (CT-057): 51, lateral view; 52, ventral view.

Scale lines: all 0.1 mm.



Figures 53–60. *Ecnomus* spp. Male genitalia.

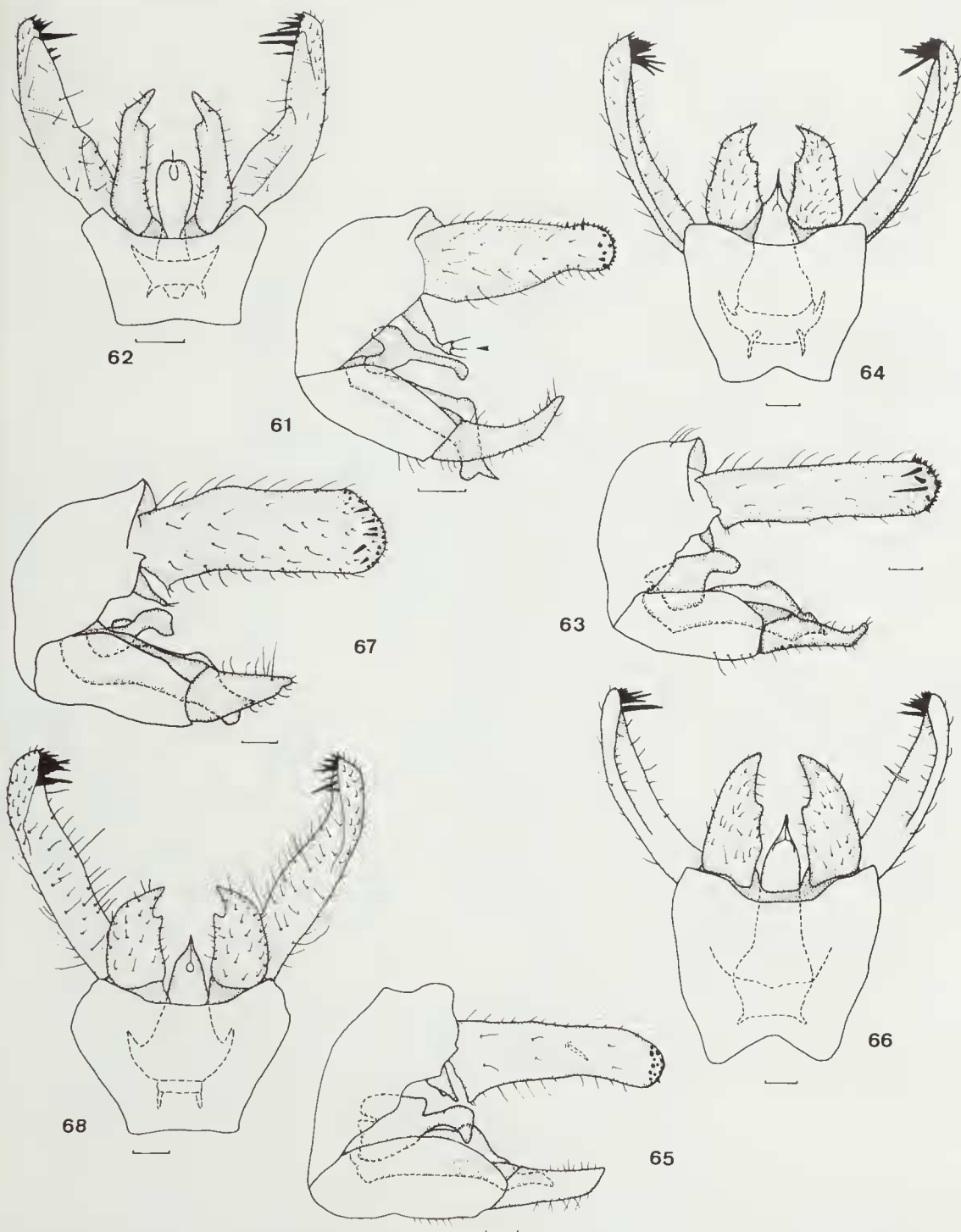
53, 54. *Ecnomus centralis* sp. nov., paratype, SW-Qld. (CT-038): 53, lateral view; 54, ventral view.

55, 56. *Ecnomus myallensis* sp. nov., paratype, SE-Qld. (CT-042): 55, lateral view; 55a, superior appendage, basiventral angle, ventro-lateral view; 56, ventral view

57, 58. *Ecnomus yabbura* sp. nov., paratype, N-WA. (CT-060): 57, lateral view; 58, ventral view.

59, 60. *Ecnomus miriwud* sp. nov., paratype, N-WA. (CT-068): 59, lateral view; 60, ventral view.

Scale lines: all 0.1 mm.



Figures 61–68. *Ecnomus* spp. Male genitalia.

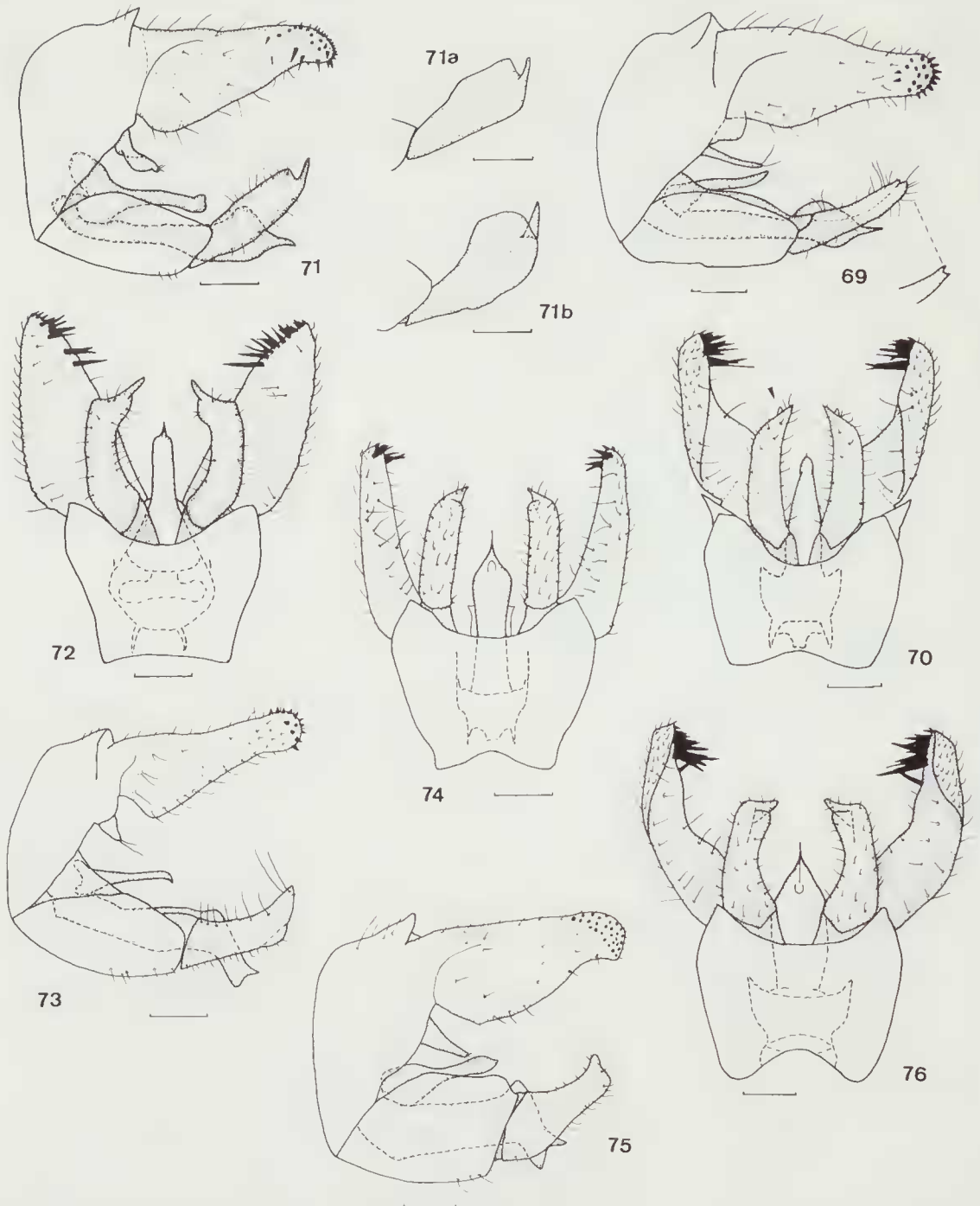
61, 62. *Ecnomus wagengugurra* sp. nov., paratype, NE-NSW. (CT-062): 61, lateral view; 62, ventral view

63, 64. *Ecnomus karawalla* sp. nov., holotype, W-Vic. (CT-032): 63, lateral view; 64, ventral view.

65, 66. *Ecnomus russellius* Neboiss, Tas. (CT-029): 65, lateral view; 66, ventral view.

67, 68. *Ecnomus karakoi* sp. nov., holotype, Vic. (CT-030): 67, lateral view; 68, ventral view.

Scale lines: all 0.1 mm.



Figures 69–76. *Ecnomus* spp. Male genitalia.

69, 70. *Ecnomus tropicus* sp. nov., paratype, NE-Qld. (CT-069): 69, lateral view, apex of inferior appendage, ventro-lateral view; 70, ventral view.

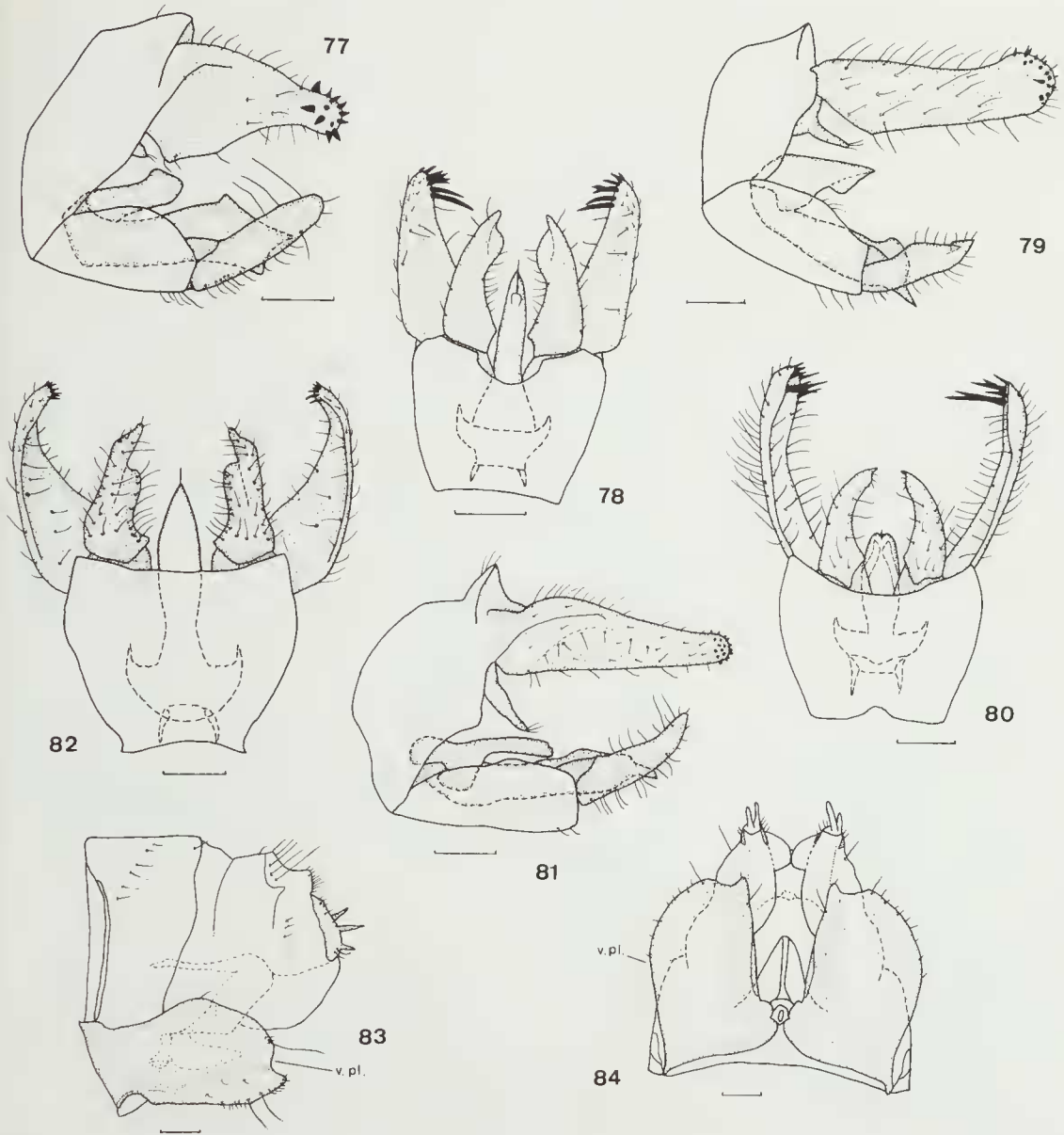
71–72. *Ecnomus apiculatus* sp. nov., paratype, N-WA. (CT-018): 71, lateral view; 72, ventral view.

71a, 71b. *Ecnomus apiculatus* sp. nov. (varieties), inferior appendage, lateral: 71a, N-WA. (CT-039); 71b, SE-Qld. (CT-039).

73, 74. *Ecnomus kinka* sp. nov., paratype, N-WA. (CT-061): 73, lateral view; 74, ventral view.

75, 76. *Ecnomus pilbarensis* sp. nov., paratype, N-WA. (CT-022): 75, lateral view; 76, ventral view.

Scale lines: all 0.1 mm.



Figures 77–84. *Ecnomus* spp. Genitalia.

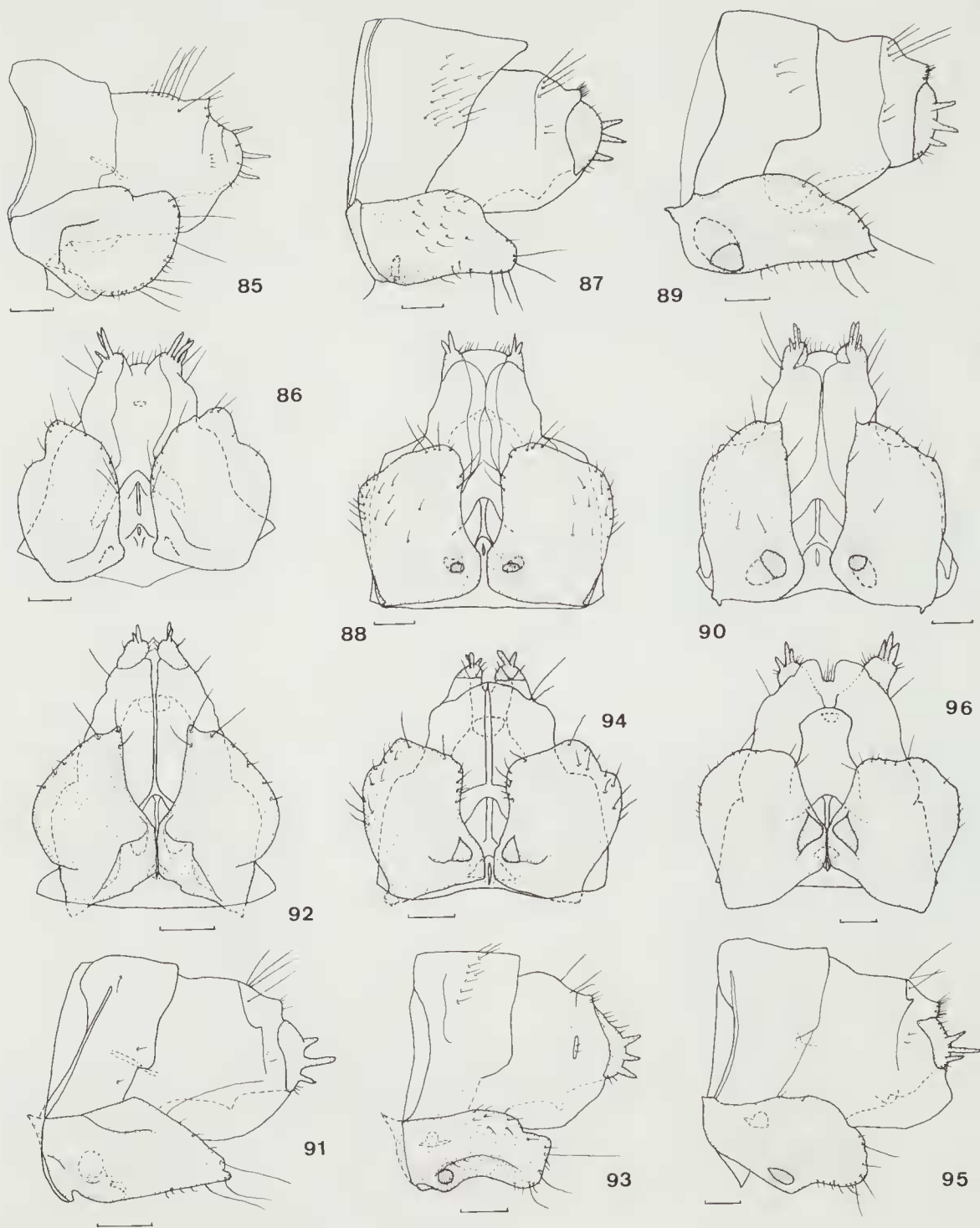
77, 78. *Ecnomus larakia* sp. nov., paratype male, N-NT. (CT-072): 77, lateral view; 78, ventral view.

79, 80. *Ecnomus pakadji* sp. nov., holotype male, NE-Qld. (CT-052): 79, lateral view; 80, ventral view.

81, 82. *Ecnomus walajandari* sp. nov., paratype male, N-WA. (CT-065): 81, lateral view; 82, ventral view.

83–84. *Ecnomus russellius* Neboiss, Tas. (CT-108), female: 83, lateral view; 84, ventral view; v.pl., ventral plate.

Scale lines: all 0.1 mm.



Figures 85–96. *Ecnomus* spp. Female genitalia.

85, 86. *Ecnomus myallensis* sp. nov., Vic. (CT-087): 85, lateral view; 86, ventral view.

87, 88. *Ecnomus pansus* Neboiss, S-WA. (CT-114): 87, lateral view; 88, ventral view.

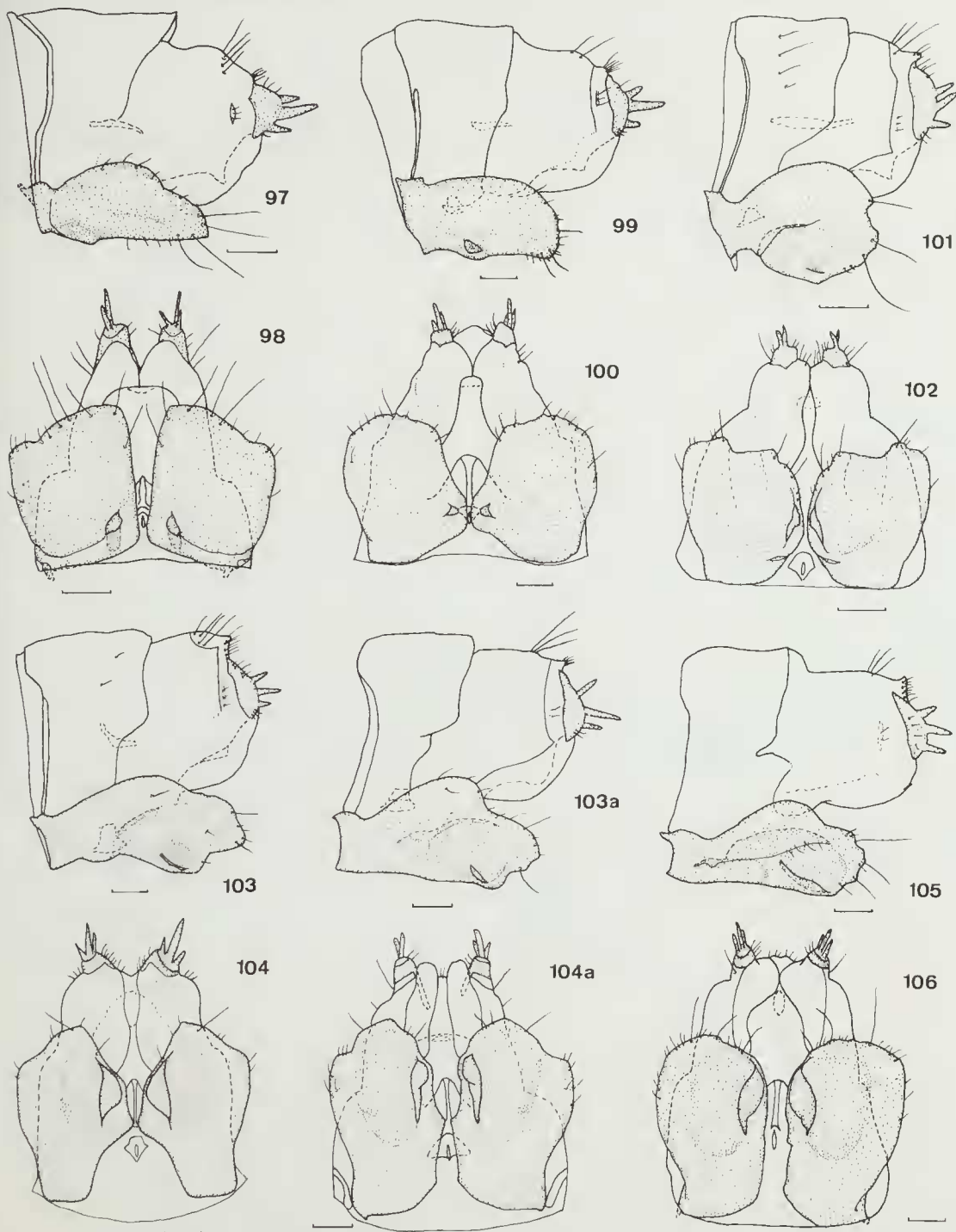
89, 90. *Ecnomus cygnitus* Neboiss, Vic. (CT-096): 89, lateral view; 90, ventral view.

91, 92. *Ecnomus tridigitus* sp. nov., paratype, NE-NSW. (CT-099): 91, lateral view; 92, ventral view.

93, 94. *Ecnomus continentalis* Ulmer, NE-Qld. (CT-106): 93, lateral view; 94, ventral view.

95, 96. *Ecnomus nibbor* sp. nov., paratype, Vic. (CT-104): 95, lateral view; 96, ventral view.

Scale lines: all 0.1 mm.



Figures 97–106. *Ecnomus* spp. Female genitalia.

97, 98. *Ecnomus turgidus* Neboiss, paratype, S-WA. (CT-113): 97, lateral view; 98, ventral view.

99, -100. *Ecnomus deani* sp. nov., SE-NSW. (CT-110): 99, lateral view; 100, ventral view.

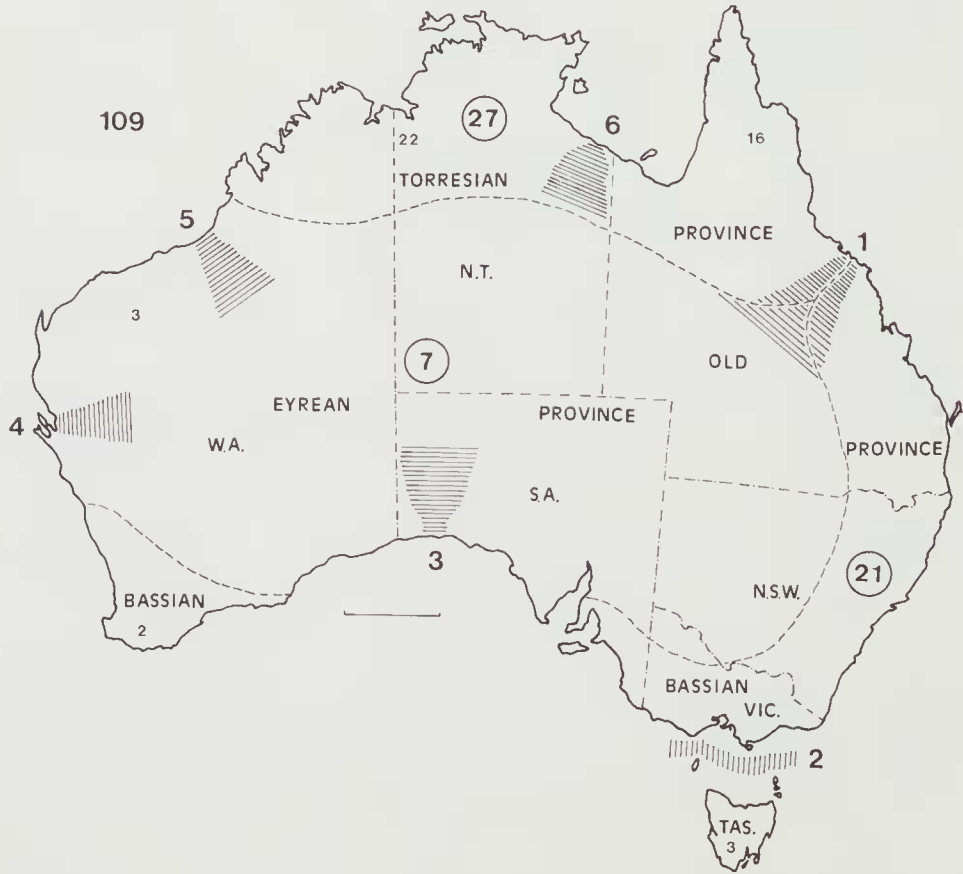
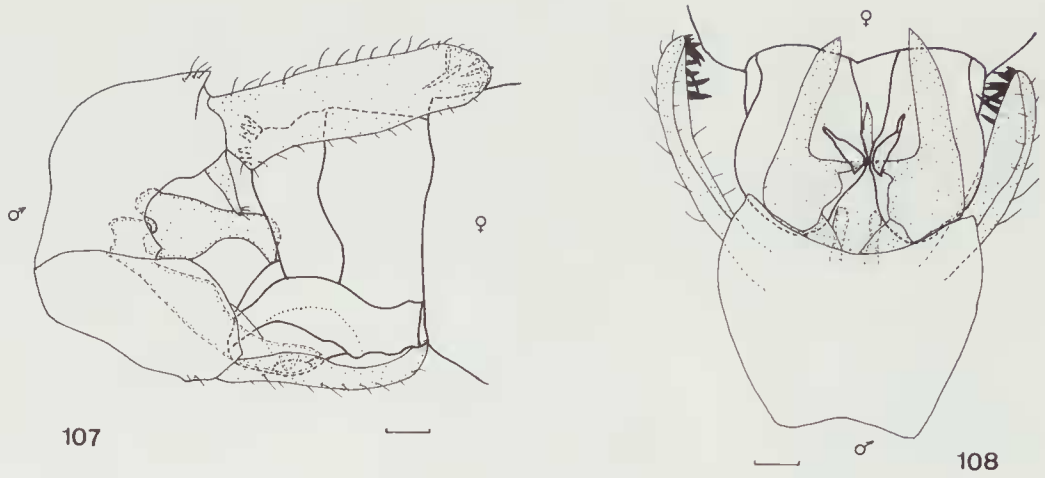
101, 102. *Ecnomus wellsae* sp. nov., paratype, NE-NSW. (CT-097): 101, lateral view; 102, ventral view.

103, 104. *Ecnomus tillyardi* Mosely, Tas. (CT-107): 103, lateral view; 104, ventral view.

103a, 104a. *Ecnomus tillyardi* Mosely (variety) E-Vic. (CT-109): 103a, lateral view; 104a, ventral view.

105, 106. *Ecnomus volsellus* sp. nov., paratype, Vic. (CT-092): 105, lateral view; 106, ventral view.

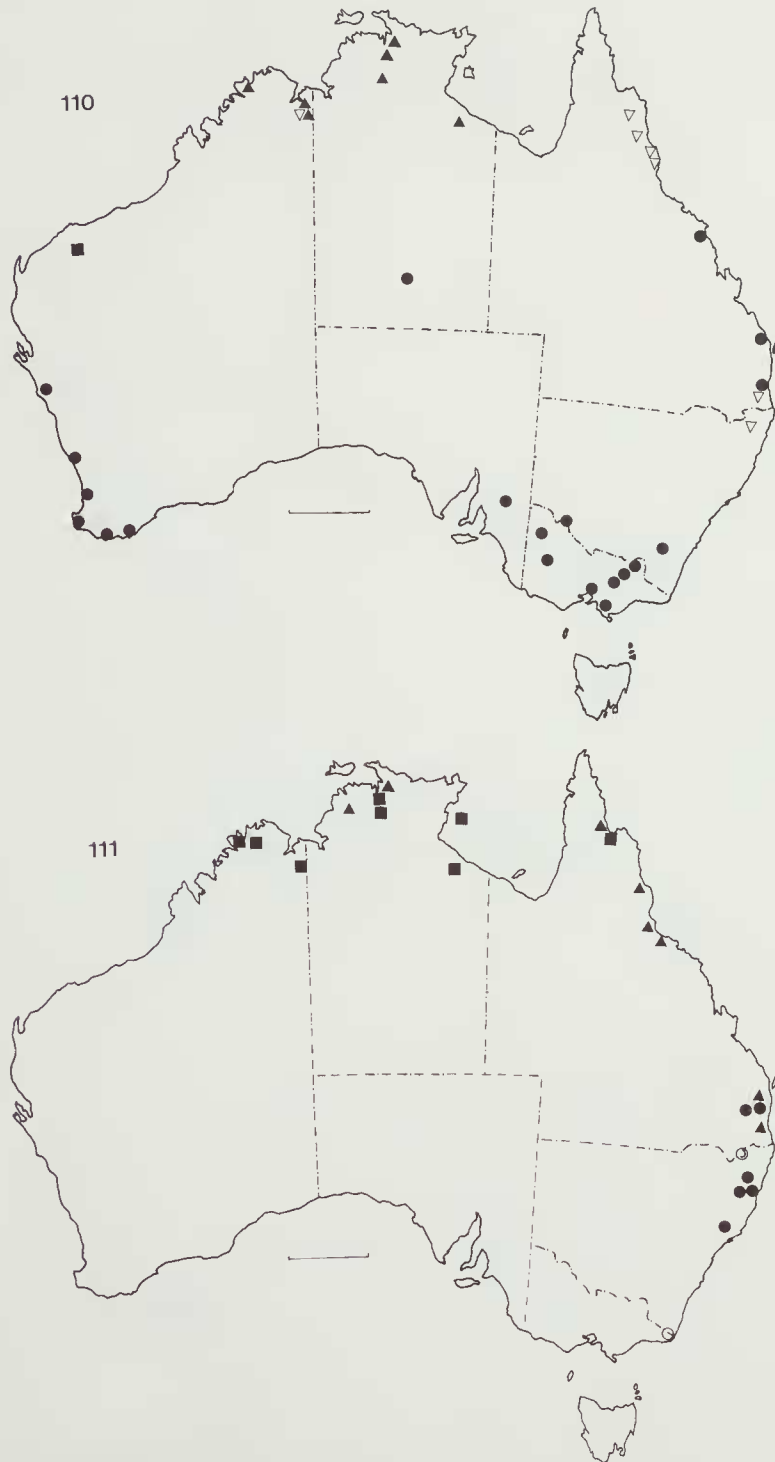
Scale lines: all 0.1 mm.



Figures 107–109.

107, 108. *Ecnomus tillyardi* Mosely (variety), male and female in copula, Vic. (CT-093): 107, lateral view; 108, ventral view. 109, faunal provinces of Australia, with associated barriers or disjunctions (////), total number of species of *Ecnomus* in each province indicated by (N), number of species of *Ecnomus* in each region (between barriers) indicated by N.

Scale lines: figs 107, 108, 0.1 mm; fig. 109, 500 km.

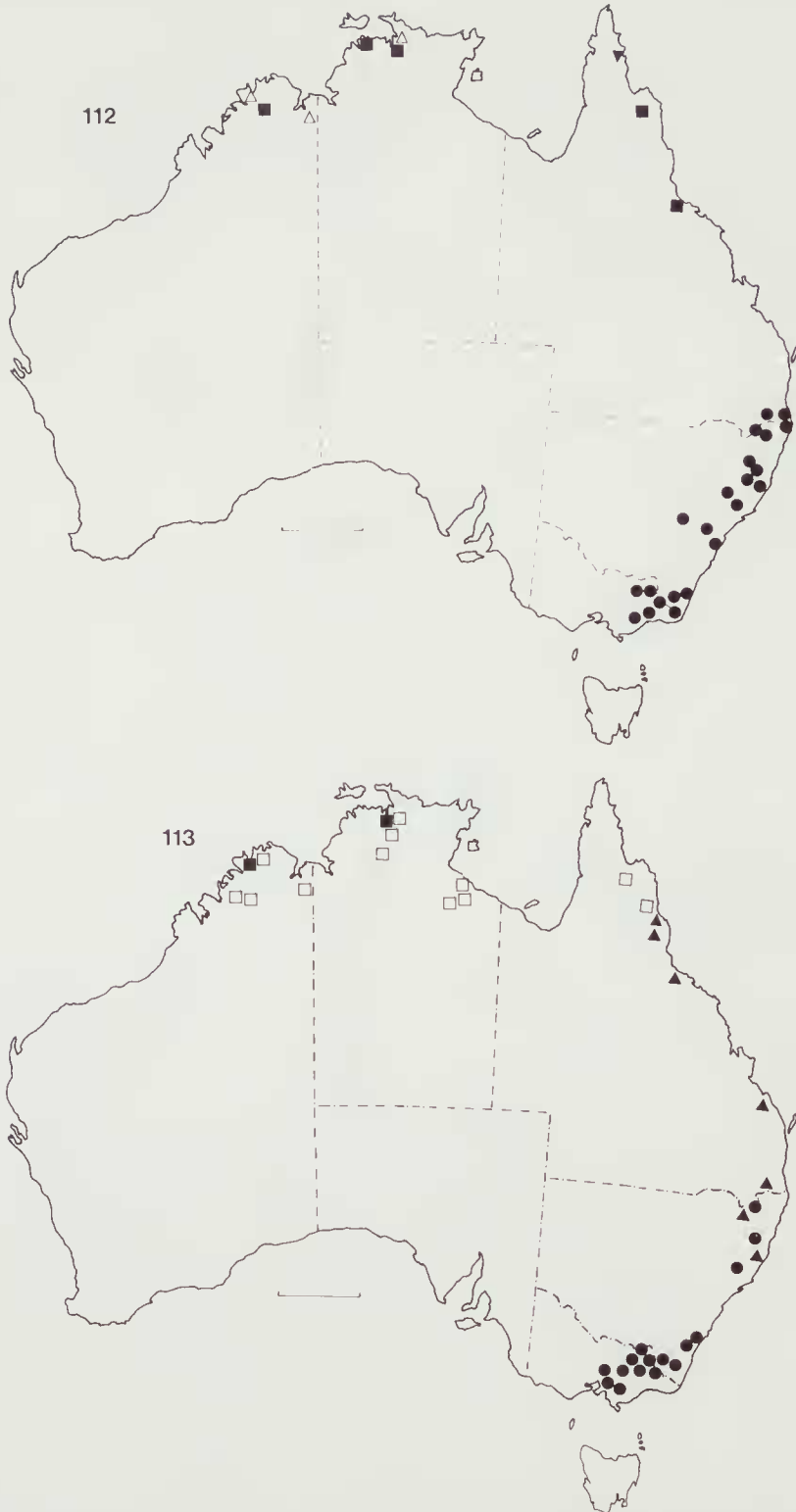


Figures 110, 111. Distribution of *Ecnomus* species.

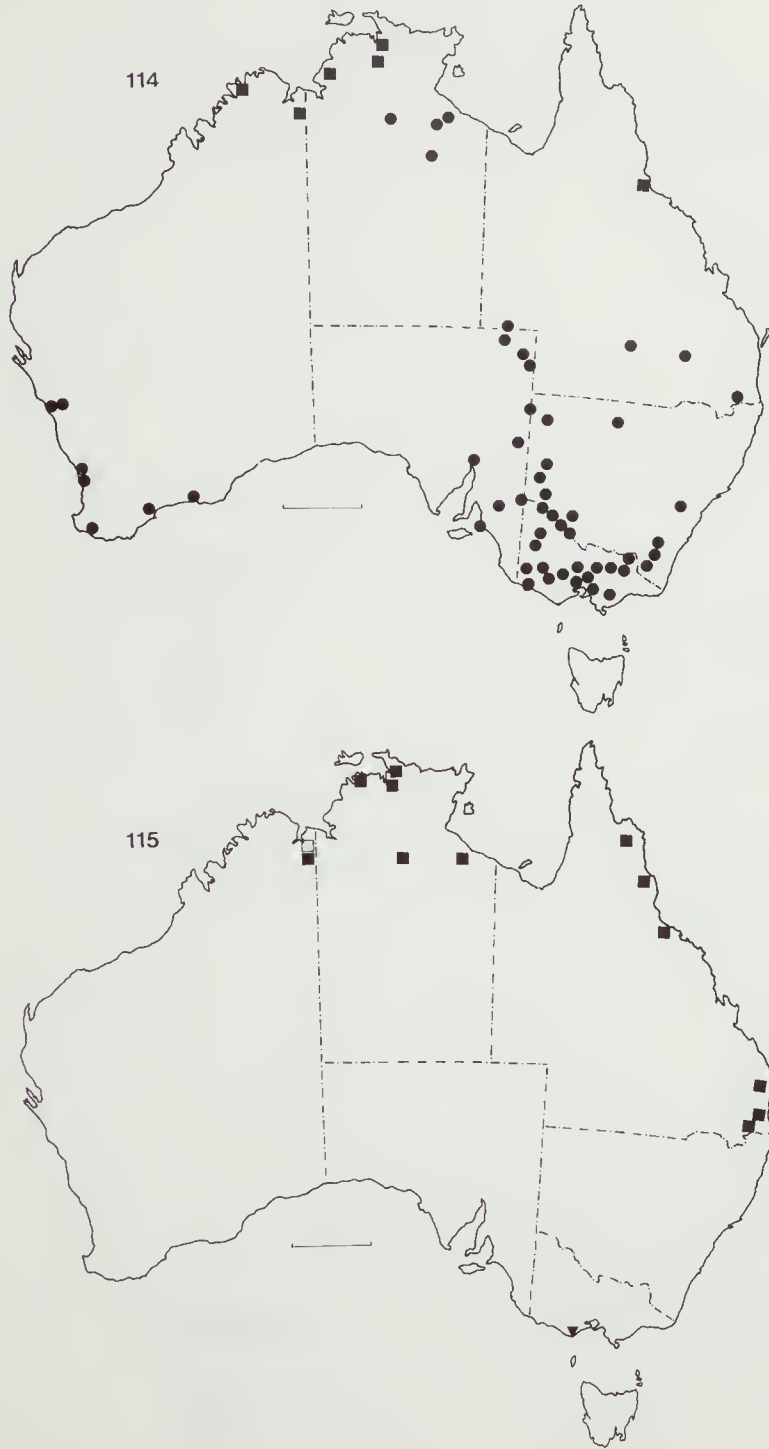
110, *Ecnomus ingibandi* sp. nov. (■); *Ecnomus kitabal* sp. nov. (▽); *Ecnomus jimba* sp. nov. (▲); *Ecnomus turgidus* Neboiss (●).

111, *Ecnomus veratus* sp. nov. (■); *Ecnomus tridigitus* sp. nov. (●); *Ecnomus nevoissi* sp. nov. (○); *Ecnomus turrbal* sp. nov. (▲).

Scale lines: all 500 km.



Figures 112, 113. Distribution of *Ecnomus* species.
 112, *Ecnomus digrutus* sp. nov. (Δ); *Ecnomus volsellus* sp. nov. (●); *Ecnomus larakia* sp. nov. (■); *Ecnomus pakadji* sp. nov. (▼); 113, *Ecnomus kakaduensis* sp. nov. (■); *Ecnomus wellsae* sp. nov. (▲); *Ecnomus deani* sp. nov. (●); *Ecnomus miriwud* sp. nov. (□).
 Scale lines: all 500 km.

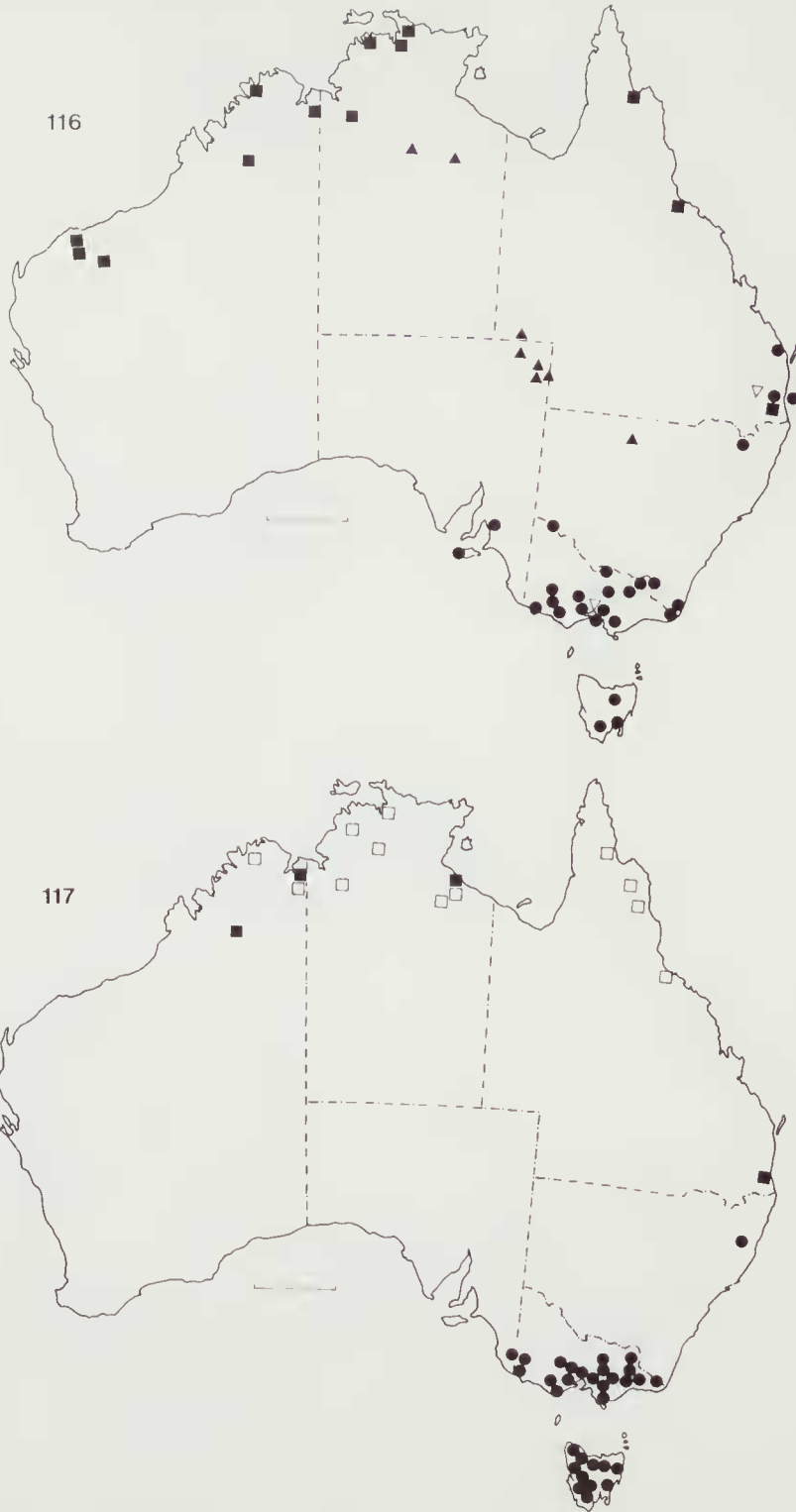


Figures 114, 115. Distribution of *Ecnomus* species.

114, *Ecnomus wororan* sp. nov. (■); *Ecnomus pansus* Neboiss (●).

115, *Ecnomus cuspidis* sp. nov. (■); *Ecnomus karakoi* sp. nov. (▼); *Ecnomus bishopi* sp. nov. (□).

Scale lines: all 500 km.

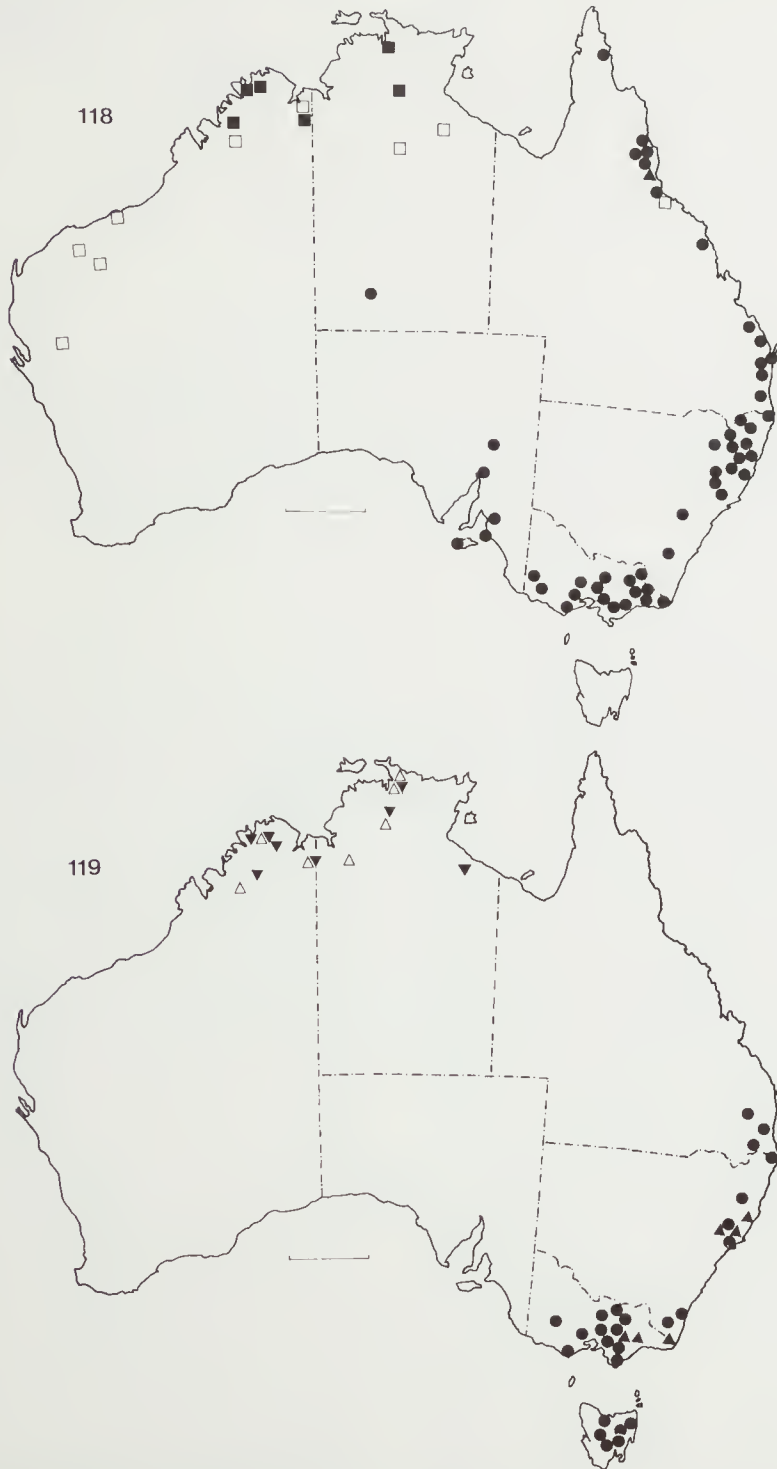


Figures 116, 117. Distribution of *Ecnomus* species.

116, *Ecnomus clavatus* sp. nov. (■); *Ecnomus cygnitus* Neboiss (●); *Ecnomus centralis* sp. nov. (▲); *Ecnomus myallensis* sp. nov. (▽).

117, *Ecnomus tillyardi* Mosely (●); *Ecnomus apiculatus* sp. nov. (■); *Ecnomus kinka* sp. nov. (□).

Scale lines: all 500 km.



Figures 118, 119. Distribution of *Ecnomus* species.

118, *Ecnomus kerema* sp. nov. (▲); *Ecnomus continentalis* Ulmer (●); *Ecnomus ancisus* sp. nov. (■); *Ecnomus pilbarensis* sp. nov. (□).

119, *Ecnomus nibbor* sp. nov. (▲); *Ecnomus blythi* sp. nov. (△); *Ecnomus yabbura* sp. nov. (▼); *Ecnomus russellius* Neboiss (●).

Scale lines: all 500 km.



Figure 120. Distribution of *Ecnomus* species. *Ecnomus wagengugurra* sp. nov. (o); *Ecnomus karawalla* sp. nov. (●); *Ecnomus tropicus* sp. nov. (▲); *Ecnomus walajandari* sp. nov. (▼).
Scale line: 500 km.